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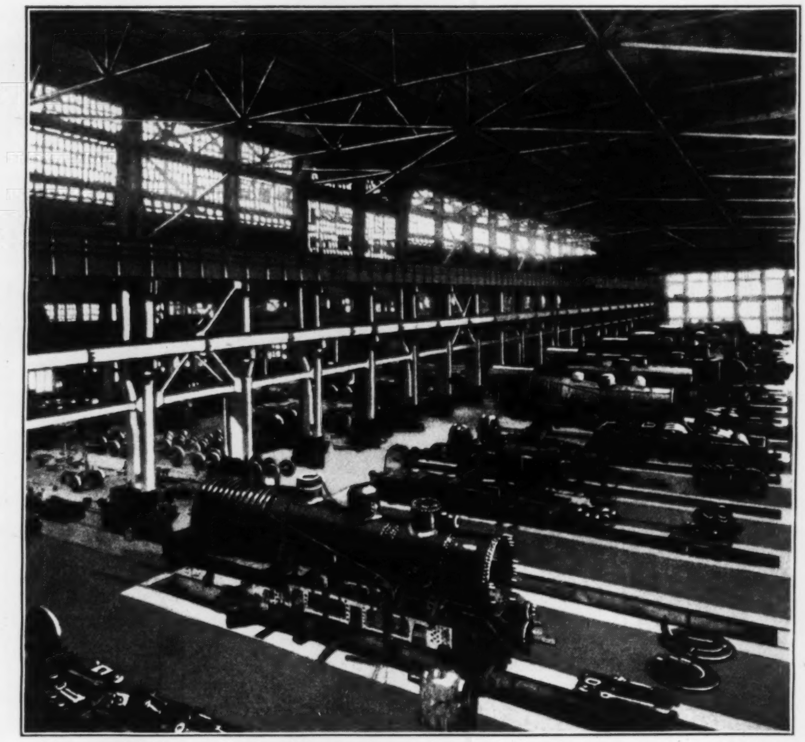

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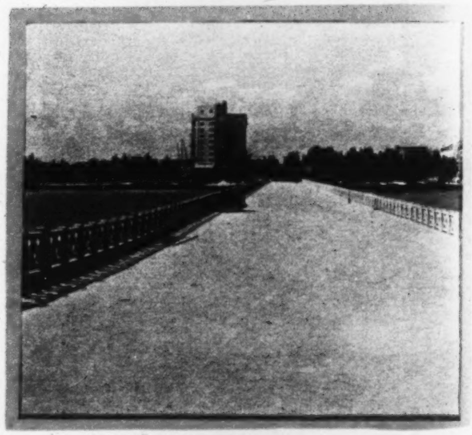
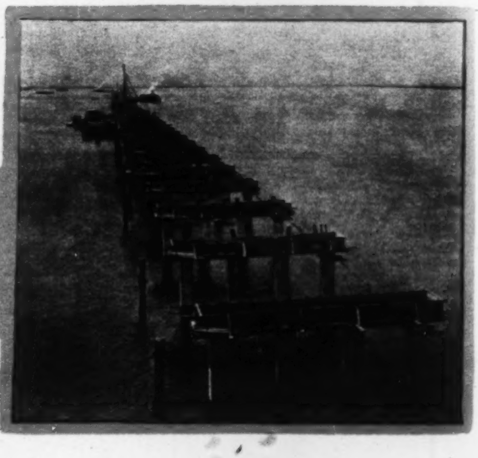




# ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, NOVEMBER 27, 1930 Number 22

## *Philadelphia Scores*

EFFECTIVE planning of a technical meeting was admirably illustrated last week at a special meeting on the subject of traffic congestion and its remedies sponsored by the Engineers Club of Philadelphia and the local section of the American Society of Civil Engineers. Elements of success were the selection of a topic of timely interest, its subdivision into logical elements, assignment of each to an expert of acknowledged ability, rigid adherence to a predetermined time schedule, and advance publicity. The result was a capacity audience which not only listened with eager attention but also took active part in the discussion which followed presentation of the papers. Those responsible for the meeting are to be congratulated for an accomplishment which is, unfortunately, more often wished for than attained.

## *Progressive Methods*

OUT of the close relationship of civil engineering art and science grow ever more possibilities as the art progresses. Science can give more aid to the engineer than he currently utilizes, and can provide sureness where the art otherwise would grope. A suggestive illustration is the large-scale use made of rigid-frame construction in a building foundation on compressible soil which G. W. Glick describes on another page. The ingenuity of the conception is well matched by the effectiveness of the method by which the structure was analyzed. Soft-ground foundations are a traditional source of trouble and worry to the builder of large structures, and the resources available for controlling settlement over large areas have always been less than adequate. The deep cellular mat resorted to in the Albany case accomplishes the desired purpose in surprisingly effective manner by virtue of its rigidity and simplicity. But without the help of a convincing analysis of its action there might have remained some doubt as to its entire adequacy. Study of what was done in the Albany case therefore is of unusual stimulative value both in presenting a new type of foundation construction and in exhibiting the possibilities that lie in progressive methods resting on advanced scientific knowledge.

## *Delayed Payment*

UNEXPECTED repercussions have followed the unemployment and drought relief campaigns to hasten road construction. Haste made the journey quickly over. The drought itself contributed to this result by providing continuously favorable working conditions for the season's normal operations; contracts were completed in far less than allotted construction periods. State road funds, however, accumulated only at normal speed. Contractors therefore have found the states without money to meet final estimates, and the states have found themselves unable to make commitments for construction to fill out the shortened season. Not in all states does this situation exist, but in many it is very definite, and neither they nor their contractors are pleased with the experience. While the contractor waits for his estimates, the manufacturers and producers who sold him equipment and materials wait for their payments. And the state highway departments can do nothing but wait until the tax money comes in and federal aid-money swings through its long, slow course of becoming cash that can be paid out. The irritating fact is that no one in particular is to blame. Through emotional motives we speeded up one element of a train of processes geared to a normal rate of progress. Importuned to proceed faster and aided by favorable weather for speed, road construction has overtaken and passed road financing and now has to wait for the latter to catch up. Whatever the fundamental lesson may be, the experience is certainly not one which will be welcomed again by either the highway industries or the public-roads official.

## *Utility Prospects*

MANY a hard battle over public policy toward public service corporations remains, and from the recent election it appears that the ordinary citizen is aware of the fact and is ready for the battle. Dismissing all the political aspects of the election, we have reason to consider its meaning with respect to public service economics and policies, inasmuch as the voters elected many men who favor effective regulation of utilities while they retired some whose attitude in this matter appeared doubtful. In the background are various happenings that tend to disturb public confidence in the good sense of utility management. One company recently entered upon cut-rate operations to drive a public plant out of business. Another company published advertisements in many cities denouncing regulation of utilities. Several railway men have been protesting against road and waterway building as setting up illegitimate competition, and have been charging the government with deliberate intention of impoverishing them. Such events are out of harmony with the views of the best thinkers among utility men, but no protest has come from their ranks against any actions of the kind mentioned, and this naturally builds up a public belief that the actions of a few have the indorsement of all. Sound practice and sound sentiment in the utility field are steadily evolving, but their progress is handicapped by this condition. For the present it is clear that the antagonism aroused by improper utterances and activities on the part of utility men threatens a new public hostility. This is unfortunate, since it delays peaceful and constructive adjustment of utility relations. The situation of today suggests that utility interests could make a constructive contribution by uniting upon a sound utility policy, and making this policy known so widely that it can obtain universal public acceptance and become the basis for lasting adjustment of the joint problems of public and utility.

## *Awaiting Final Decision*

THE GROUP of half a hundred routes originally proposed for the Colorado River aqueduct has been narrowed down to one, and this has now been stamped with the official approval of the Metropolitan Water District's chief engineer, Frank E. Weymouth. This route, which diverts water from the Colorado above Parker, Ariz., has been placed before the consulting board and the directors of the district for final approval. Thus Los Angeles and its neighboring communities have advanced another step in the solution of their urgent water supply problem. The district is carrying forward its project with effective thoroughness. Since the time when the Colorado River was foreseen as the only ultimate supply feasible for this region, plans have been initiated and developed with commendable energy. The work of the district's engineers in detail study of routes during the past ten months is fully in harmony with this history. It had to deal with varied and complex factors. Thus, the weight of geological considerations was primary. Proximity to the great San Andreas rift, an active fault, and the barrier presented by deep, gravel-filled valleys where tunnels are not practicable resulted in the selection of alignments differing widely from those dictated by mere topographic requirements. Added factors of importance are the risk of political complications and interstate tax problems on those routes whose diversion points are beyond the California boundary. Should the broader aspects of the problem to be weighed by the consulting board confirm the selection of the Parker route, the resulting unity of opinion will virtually assure a favorable vote on the bond issue of more than $200,000,000 soon to be submitted.

## *Thought for the Future*

FORESIGHT being more profitable than hindsight, the conclusions reached by the Regional Plan of New York and Its Environs in a recent report as to the causes and cure of traffic congestion in the metropolis should be of benefit to those forward-looking communities that are providing for future growth in accordance with a regional plan. Single skyscrapers and small groups of skyscrapers are acquitted of the charge of causing traffic congestion. Instead, blame is placed on the excessive bulk of buildings over large areas as now permitted by the zoning laws Usurpation of the streets for other than traffic movement results. The Regional Plan urges as remedial measures that property owners be compelled to provide space within their property for parking and for loading and unloading merchandise, and that setbacks from the street be required of stores which are responsible for an excessive amount of pedestrian traffic. Construction of bypass highways to eliminate through traffic from busy streets is also recommended. Widening streets is adjudged futile under present conditions, because after the necessary land has been condemned the former property owners are permitted to continue to use it for their private business. The problem is becoming so serious, the report says, that a change of opinion on the part of property owners is taking place as they have come to realize that reduced accessibility to their property is driving away business. New York's congestion became acute after the city grew to metropolitan proportions. Smaller and growing communities may profitably study the suggested remedies in order that they may provide against like conditions in ample time.

## *Combination Building Design*

ALTHOUGH structural steel and reinforced concrete are to a large extent competitive in the construction of large buildings, there is some overlapping or combination of the two systems. Thus we have concrete-cased steel beams and structural steel reinforcement for concrete columns, both resulting in what may be termed compound members which reflect certain advantages of both materials. In addition to such compound members, however, there is sometimes a combination of both systems in one structure—that is, the use of steel framing in some parts and reinforced concrete in other parts of the same building. An example of such a combination design in a 27-story building is described in this issue. Two objectives in such designs are economy of cost incident to the use of reinforced concrete in place of steel, and reduction in size of columns because of the use of steel in the lower stories where the greater loads are carried. This second point is of particular importance in regard to use or occupancy of the building. As to economy, the saving in cost of steel may be offset to some extent by the amount of special detailing required. For example, in the building already mentioned, there are special details for splicing steel columns to concrete columns and for connecting concrete beams to steel columns. In the design, also, more time is probably required for a combination structural frame than for one which is entirely of steel or concrete. That there are net advantages in the combination system seems to be indicated by its adoption in certain large buildings, although obviously its use is limited to cases where special conditions obtain.

## *Fees for Bidding?*

THE COST of preparing a bid is an inseparable part of a contractor's expense in conducting his business, and is taken care of in the overhead item of every bid he submits. If the practice of charging fees for bidding, as established by several groups of contractors in the South, becomes a recognized element of contracting method it will surely undermine the confidence and trust in contracting now held by engineers, architects and the public. Such practice penalizes the owner and increases the cost of construction; it is unjustified and unsound. The cost of preparing bids is part of the cost of selling construction service, and is no more entitled to special reimbursement than the selling cost of every other competitive business.

Designed to compensate unsuccessful bidders on competitive bidding projects for their time and expense in preparing estimates which do not result in procuring a contract, the plan is operated as follows, subject to local variations: On each competitive construction job some official of the branch of the Associated General Contractors in whose jurisdiction the work will come ascertains the names of all general contractors bidding on the job. From the engineer's estimate, if available, or by consultation with at least three bidders, this same official determines the amount of the average bid. Each bidder is then instructed to add to his bid an amount for estimating cost (taken from a standard table and averaging $100 per $100,000 bid) multiplied by the number of bidders participating. Each bidder agrees that if he secures the work the added amount will be turned over to the A.G.C. when the first payment on the work is made by the owner. At this latter time the A.G.C. remits to each unsuccessful bidder his portion of the fund, and keeps the successful bidder's share as a fee for handling the transaction. Sometimes, however, the fees are distributed to only a certain number or certain percentage of *low* bidders, on the theory that the high bidders do not deserve to be reimbursed.

It will be noted that the successful bidder receives no share. Therefore each bidder knows that he must add his cost of estimating to the overhead item in his bid. Thus the owner is already paying for this particular contractor's bidding service and in addition is assessed a surcharge to cover the cost of service of the unsuccessful bidders. It is obvious that the plan operates to penalize the owner.

Ostensibly the owner, the engineer and the architect are aware that the practice is being applied to their job. In cases where the legality of the procedure is in doubt or where opposition is expected, some degree of secrecy is necessary in using the system. But it is the inherent unsoundness of the practice even more than the backstairs methods of applying it that condemns it as opposed to the welfare of contracting. Any agreement on one or more items of a bid and any possibility of collusion and price fixing strikes at the heart of the principle of competitive bidding. It will be recalled that the bridge pooling of former days, first designed to cut down the expense of bidding, developed into a price-fixing and contract-assigning system and was eventually broken up.

Engineers have a right, moreover, to suspect that under a fee system many "complimentary" bids will be submitted merely to collect the estimating fee. Realizing this possibility, one A.G.C. chapter leaves it to the honor of the contractor submitting a complimentary bid to reveal the fact and refuse to participate in the distribution of fees. On the whole, however, it seems more than likely that, should the practice get well established, the fees would naturally rise to a point where bidding would become a profitable business.

If general contractors think that they should receive special compensation for submitting bids, why do they not propose to recompense subcontractors and material men for their share in preparing the total bid? They have not done so, yet the expense and trouble of submitting sub-bids is relatively as great as that of the general contractor. Obviously, such a detailed, though just, scheme would be wholly impracticable. The leaders in the contracting industry realize that the close cooperation with subcontractors and material men is vital to the welfare of the industry, and are working to this end; is it not foolish, then, to set up a practice that threatens to break down such cooperation?

Organized contracting has long sought to improve the contracting industry; to bring it into repute into the eyes of engineers, architects and the public; to establish more cordial relations among all concerned in the disjointed business of construction; and to establish the contract system in the place of day labor work. It has succeeded admirably in this purpose, and should oppose any system that threatens the results of its efforts. The monetary gain of charging fees for bidding falls far short of paying for the loss of public respect and confidence. We look to organized contracting to stop this practice before outside action compels its abandonment.

## Motor Vehicle Tax Principles

PRONOUNCEMENT of definite principles of highway administration and finance, summarized elsewhere in this issue, is an important step toward the control of a financing and taxing policy which has in the last two years been rapidly getting out of hand. Speaking from exact knowledge of conditions, the responsible highway officials of the nation in convention at Pittsburgh last week set forth three doctrines: first, that all motor-vehicle taxes should be imposed by the state alone and their expenditure should be controlled by the state; second, that all motor-vehicle taxes should be used solely for road improvement; third, that state road system construction should be a prior lien on state highway funds until this system is so extended that money can be spared for diversion to local roads.

These principles impress by their fundamental soundness. In their adoption the fact was clearly recognized that they have been violated in most states and that correction would be a slow process. The danger that it was sought to prevent is further growth of violation. This danger is now upon all highway administrations. Motor-vehicle taxes, which are based solely on the principle of benefit from their expenditure, are being increasingly diverted to uses that have no relation to highway service. Political parties and legislatures, desiring more tax money but too timid to levy higher general taxes, have taken advantage of a method of taxation made popular by its basic appeal of specific service. Continuation of this course spells disaster to motor-vehicle imposts as a means of providing more and better roads. Public reaction to these imposts has already set in, and is becoming definitely noticeable.

Signs of the reaction are plentiful. Oil interests are showing themselves ill content at seeing a constantly increasing sales tax on a cheap commodity devoted to purposes that in no way promote the use of that commodity. Motor-vehicle manufacturers are equally dissatisfied with having the use of their product carry a license charge that is spent for other purposes than highways to encourage the use of automobiles and motor trucks. Commercial bus and truck operators are complaining of restrictions on their use of the roads, and of high vehicle taxes that are not being used to create roads that can be more freely used. When in addition the automobilist awakens to the knowledge that the four to six cents added to the cost of his gallon of gasoline is an excise tax to pay for anything for which a state legislature may desire to make appropriation and is not wholly a benefit tax for road use, he will also join these groups of the more selfishly discontented.

These are the hazards that thoughtful highway officials perceive are ahead of the present movement toward wide division and diversion of motor-vehicle taxes. They endanger the main source of highway funds and delay the program of primary road improvement which was promised the road user as a condition of his support by paying a special impost on motor-vehicle use. It is breaking faith with the taxpayer to dissipate his gasoline and vehicle tax money for local uses, for schools, hospitals, village expenses or farm byways, until the main roads which serve three-quarters of the population are substantially improved. The local road deserves recognition, but it must take its orderly place among the factors that enter into the economics of highway transportation. And there should be no diversion whatever of road-service taxes to other than highway purposes.

# Rigid Rectangular Frame Foundation for Albany Telephone Building

### Two-Story Reinforced-Concrete Framework Without Diagonal Members Insures Equal Settlement on Yielding Soil With Column Loads Unequal

By G. W. Glick
*Moran & Proctor, Consulting Engineers, New York, N. Y.*

A REINFORCED-CONCRETE foundation mat and two superimposed basement stories of reinforced concrete designed to act together as a rigid-frame structure form the interesting and unusual foundation for the new section B of the main telephone building at Albany, N. Y.

This building, recently completed by the New York Telephone Co. as an extension to its existing plant, is approximately 94x167 ft., with three basements and eleven stories of superstructure. The three basements are of reinforced concrete, while the superstructure is of steel construction with stone-concrete floors and fireproofing and walls of brick with stone trim. The building is to be used for offices and telephone exchanges. The equipment floors are designed for a live load of 150 lb. per square foot, and the aggregate of the live and dead loads to the level of the mat subgrade is estimated at 4,500 lb. per square foot of building area.

*Conditions and Requirements*—The problem of safely supporting a building of this weight on soil is not ordinarily difficult, but two factors made the foundation design of the Albany telephone building complicated and important. These were: (1) the character of the soil on which the building must be supported; and (2) the necessity, because of the delicate mechanism of the telephone exchanges, that the building be free from unequal settlements.

The site of the building, on Capitol Hill, is a clay formation extending to a depth of over 100 ft. to rock. Albany clay is well known and wholesomely respected by builders who have struggled with it, and many buildings founded on it have suffered serious settlements. The clay when first excavated frequently has the appearance of a comparatively dry, firm material, but upon being worked or kneaded soon becomes a soft plastic mass, and a physical analysis shows it to contain nearly 50 per cent by volume of water. The undisturbed clay has a relatively low load-bearing capacity, and any substantial superimposed loading will cause its gradual settlement and consolidation, accompanied by a reduction of its water content.

*Study Points to Mat Type*—Economy in cost as well

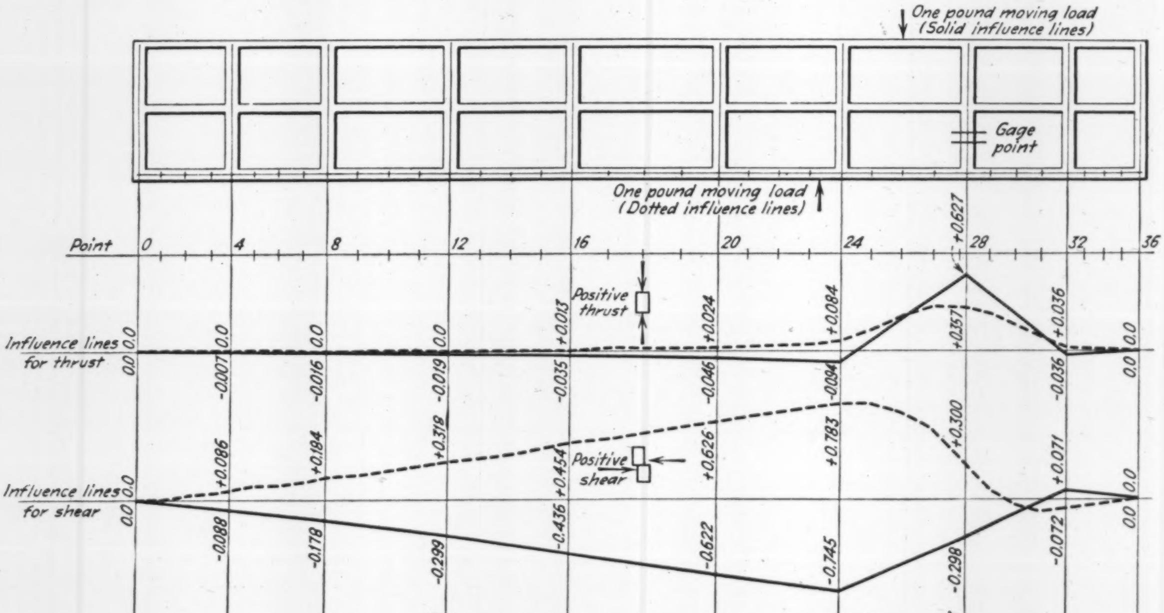


FIG. 1—INFLUENCE LINES DETERMINED BY DEFORMETER FROM MODEL OF FOUNDATION FRAME

as structural safety governed the selection of the type of foundation. It was considered that any type of friction pile could be relied upon to carry but little more load than the undisturbed soil itself. Cylinders or piers to rock would support the building safely and without settlement, but their cost was prohibitive. A study of the characteristics of the soil and the behavior of other structures supported on it indicated that any structure on this material will settle more or less during a long period of time but will eventually come to rest, and the clay will stabilize itself under its new load condition. This latter fact, with the considerable economy in cost, led finally to the choice of a continuous foundation mat which could distribute the weight of the building over its entire area.

Having adopted a mat type of foundation, the engineers proceeded to develop a design which would offer a minimum general settlement with a maximum uniformity of settlement throughout the building. The design was predicated: (1) on the uniform distribution, as nearly as possible, of the weight of the building over its entire area, with an average unit load on the soil of 4,500 lb. per square foot; and (2) on the conclusion, after a careful study of the clay, that it would support a superimposed load of 2,000 to 3,000 lb. per square foot with an ultimate settlement of about 2 in.

The subgrade for the foundation mat was 20 to 25 ft. below the natural ground surface, so the general excavation removed a load of about 2,500 lb. per square foot at the subgrade level, for which an equivalent weight of building could be substituted without causing movement or settlement of the underlying soil. The distribution then, at this level, of a building load of 4,500 lb. per square foot loaded the soil to only 2,000 lb. per square foot in excess of its original condition, and under this load it was felt that a mat type of foundation would be entirely satisfactory, provided it were so stiffened as to prevent unequal settlement.

The usual foundation mat is designed as an inverted slab system, spanning between supporting points and carrying the weight of the building as a load uniformly distributed on the soil. Such a design permits a limited amount of variation in column loading, distributes the building weight over local soft spots in the bearing strata and provides generally a certain amount of continuity in foundation structure. It cannot, however, without objectionable settlement, care for large variations in column loads or span over large areas of soft ground; and particularly, it cannot prevent the dishing or sagging toward the center of the mat area which is characteristic of such a foundation on a compressible soil.

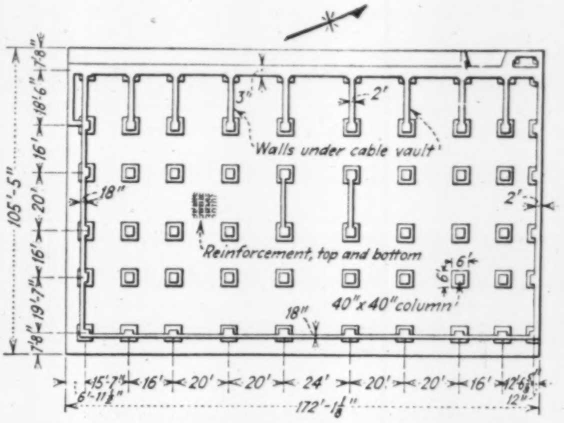

105'-5"
7'8"
18'6"
16'
20'
16'
19'-7"
7'8"
3"
2'
Walls under cable vault
18"
2'
Reinforcement, top and bottom
6'
6'
40"x40" column
18"
15'-7"
16'
20'
20'
24'
20'
20'
16'
12'-6$\frac{5}{8}$"
6'-11$\frac{1}{2}$"
172'-1$\frac{1}{8}$"
12"

FIG. 2—BEARING MAT AND BASEMENT C FRAMING
Uniform settlement of clay soil and low cost dictated choice of mat.

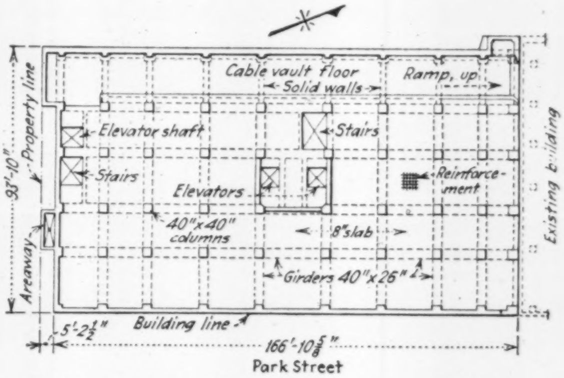

93'-10"
Property line
Areaway
Cable vault floor
Solid walls
Ramp, up
Elevator shaft
Stairs
Stairs
Elevators
Reinforcement
40"x40" columns
8" slab
Girders 40"x26"
Existing building
5'-2$\frac{1}{2}$"
Building line
166'-10$\frac{5}{8}$"
Park Street

FIG. 3—FRAMING OF BASEMENT B FLOOR SYSTEM

*Vierendeel Truss Adopted*—A study of the general proportions of the substructure developed the fact that it could be advantageously combined into a rigid-frame, two-story-and-mat structure acting as a unit to resist unequal settlement, variations in loads and the undesirable center sag. The cellar space requirement was secondary to the requirement for uniform settlement, so that walls, columns and floor girders could be increased in size and stiffness where necessary to resist moments and shears. Such an indeterminate structure, a rigid frame which is virtually a truss without diagonal members, has been known as the Vierendeel truss, taking its name from a Belgian engineer, Vierendeel, who devoted much thought to the mathematical analysis of stresses in,

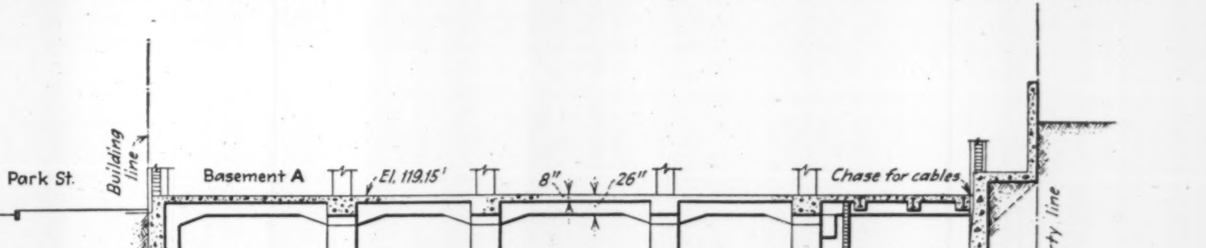

Park St.
Building line
Basement A
El. 119.15'
8"
26"
Chase for cables
Basement B
El. 108.78'
8"
26"
Cable vault
El. 105.45'
Property line
Basement C
El. 98.54'
2'-3"
Solid wall
4"
Working mat

FIG. 4—CROSS-SECTION OF RIGID FRAME FOUNDATION

and to the design of, rigid-frame structures of this type.

*Stresses Determined by Models*—The indeterminate character of the structure, particularly because of its two-story construction, and the involved mathematical analysis necessary for its design, together with the possible inaccuracy of such an analysis, caused the designing engineers to resort to the use of elastic models to determine the stresses in the structure.

Prof. George E. Beggs of Princeton University was asked to prepare celluloid models, and by the use of the Beggs deformeter to develop influence lines for thrust, shear and bending in various parts of the mat, walls, columns and floors. Professor Beggs was furnished dimensioned plans and sections of the building substructure, from which he prepared miniature models made accurately to scale. By applying unit strains at various gage points on the models and by simultaneously noting the deformation at other points, information was obtained for the determination of influence lines, as shown in Fig. 1. From these influence lines the stresses in the members of the substructure were determined and the design completed.

*Foundation Structure*—Figs. 2, 3 and 4 show respectively a plan of the mat, plan of basement B framing and a cross-section through the substructure of the building. By reference to Fig. 4 it will be seen that the rigid substructure frame, or truss, includes the frames of floors A and B, as well as the mat and all vertical walls and columns, forming together a monolithic concrete structure about 24 ft. deep. The upper and intermediate chords of the foundation "truss" were provided by the floor systems of A and B basements, which were designed as flat slabs supported on girders running in two directions on column lines. The lower chord of the "truss" was provided by the mat itself, while the vertical members were provided by the columns and side walls. Designed in this manner the various members of the substructure served the double purpose of regular structural foundation members and members of a stiffening truss, with a minimum amount of construction materials required.

*Other Settlement Safeguards*—In addition to developing truss stiffness in both transverse and longitudinal directions, the main foundation walls were heavily reinforced to act as girders to protect the facades of the building against settlement cracks. The finished foundation structure was thus made to function somewhat like a boat, stiffened both laterally and longitudinally as well as across its bottom and around its periphery.

To provide for the expected settlement of the building, all floors and belt courses were set 1½ in. higher than those of the old adjoining building. An inspection of the new structure made in February, 1930, showed absolutely no settlement cracks in either the substructure or superstructure. A record of settlement, taken on steel dowels distributed throughout basement C, showed a uniform settlement of about 1 in. with the superstructure completed except for some partitions, but with no equipment or live load in the building. From these records it is expected that the final estimated settlement of 2 in. will not be much in error and that the Vierendeel truss will function substantially as planned.

The building was designed by Voorhees, Gmelin & Walker, architects, who engaged Moran and Proctor as consulting engineers for the foundation work. The foundation contract was awarded to the Arthur A. Johnson Corp., New York, and it subcontracted the concrete work to the Turner Construction Co., New York.

# Handling Earth by Belts

## Experience in Denny Hill Cut, Seattle, Wash., Shows That Clean Discharge Results If Conveyors and Material Are Wet

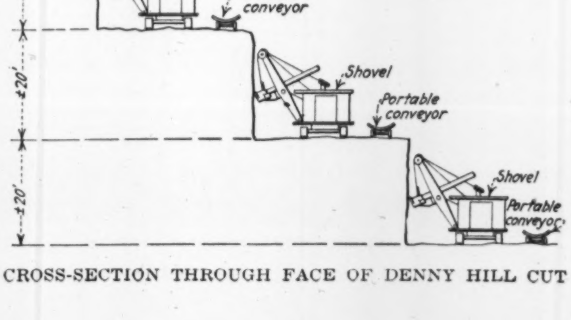
By W. F. Way

*Construction Engineer, Seattle, Wash.*

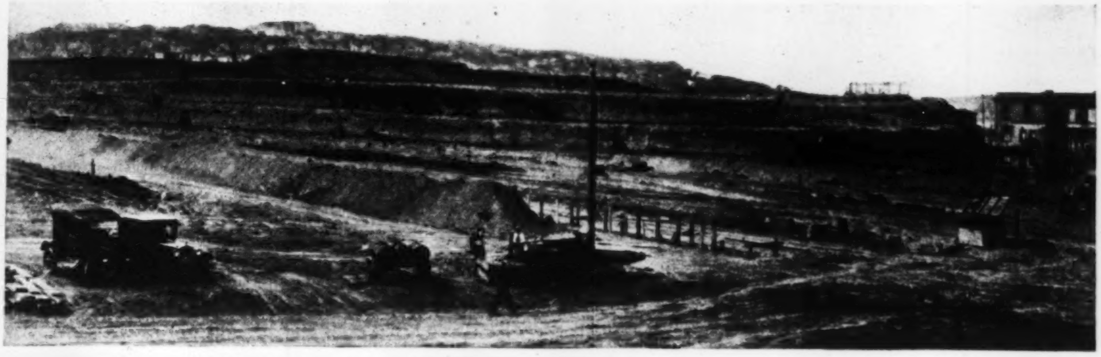
Absence of noise and nuisance are the outstanding features of the Denny Hill regrade project in Seattle, Wash., which involves taking 4,200,000 cu.yd. of material from the center of the city and moving it across seven main thoroughfares without any delay to traffic. The smooth quietness of the operation as a whole is in remarkable contrast to such nerve-racking noises as blasting, steam-shovel exhausts, the screeching of muck-car wheels on curves and the puffing of steam locomotives. There has been no blasting on the Denny Hill job, the electric shovels operate very quietly, and no muck-cars or trucks are used; the spoil is moved on motor-operated belts which slip along on ball-bearing rollers in almost complete silence. The results of an analytical study of methods and progress on this project are given in the following.

The present Denny Hill operation is the final stage of a major regrading project whose first part was completed some twenty years ago (*Engineering News*, March 31, 1910, p. 355). A general description of the design, layout and equipment used on the present undertaking was published in *Engineering News-Record*, Oct. 3, 1929, p. 523. The work has been under way since September, 1928, when the city awarded a contract for cutting down to established city grades some 32 city blocks of Denny Hill (about 95 acres) on which the maximum depth of cut would have to be 89 ft. The plan of operation is to excavate the material with power shovels and to move it on a belt-conveyor system to the waterfront where the spoil drops onto barges and is wasted in Puget Sound. The main belt-conveyor line has a total length of 3,000 ft., in addition to which there is a series of 250-ft. portable conveyor units serving as a feeder system.

Thus the loading station on the inshore end of the main belt line becomes the focal point around which several radiating lines of the portable belt units center. These portable units are shifted laterally as the work progresses with the cutting away of the hill. At this writing there are three lines of portable belt conveyors operating at different elevations about 20 ft. apart vertically. Each of these portable belt-conveyor units is



CROSS-SECTION THROUGH FACE OF DENNY HILL CUT



GENERAL VIEW OF DENNY HILL EXCAVATION ON APRIL 22, 1930
Five power shovels at work on three levels.

fed by one or two shovels delivering to portable hoppers, which straddle the belt at each loading station and are mounted on wheels so they can be kept abreast of the shovel easily. The hoppers are fitted with a grizzly made up of 1¼x8-in. steel bars, 12 in. apart. Discharge from the shovel dipper goes through this grizzly into a hopper, beneath which delivery to the belt is controlled by a mechanical feeder.

*Material*—The question of whether to use explosives to loosen up the ground for the shovels was given careful consideration. It was believed from experience with other excavation near by that this area might be underlain by a stratum of quicksand which would readily transmit to nearby structures any vibrations resulting from deep shooting. The large fragments resulting from deep shooting would be difficult to pass through the grizzlies, and on the whole there was some doubt about the fundamental question of just how much benefit there would be in blasting. It was decided, therefore, not to use powder in connection with the shovel work.

The material handled consists of glacial detritus in which there are frequent variations. Hardpan, cemented sand and gravel, blue clay, yellow clay, loam and sand have been encountered. The major portion to date has been hardpan and blue clay. Where the formation is cemented sand and gravel the digging has been very difficult for the shovels, as witness the fact that the shovel teeth have had to be renewed every four to five hours. This is in soil the moisture content of which ranges from 5 to 12 per cent and which gains about 45 per cent bulk in going from bank to loose measurement.

*Effect of Weather*—Contrary to expectations, rainy weather has had little effect upon the movement of these materials over the belts. In fact, the material leaves the belt better when wet than when dry; even wet yellow clay, the stickiest of all soils encountered, will go over the belt and leave it clean, although this same material when moist will so completely choke up the shovel dipper that it is necessary frequently to clean the dipper with hand shovels.

The point in the earth-moving system where the greatest tendency to choke occurs is the main loading chute. Experience on the Denny Hill job definitely has indicated that chutes for conveying the material even for short distances are undesirable. The large chute carrying the material from the portable conveyors to the loading end of the main conveyor is steel-lined and is set on a slope of 60 deg. with the horizontal. Spoil pounding down on this smooth surface builds up to such an extent that it keeps one workman busy clearing the chute. When the spoil is wet and sticky it is particularly hard to keep moving on this chute. The only other chute on the job is the one between the end of the belt line and the scow. This is very steep, but even so, it has given some trouble. Bunkers for storing the material even for a short period would be very troublesome. The material must be kept moving.

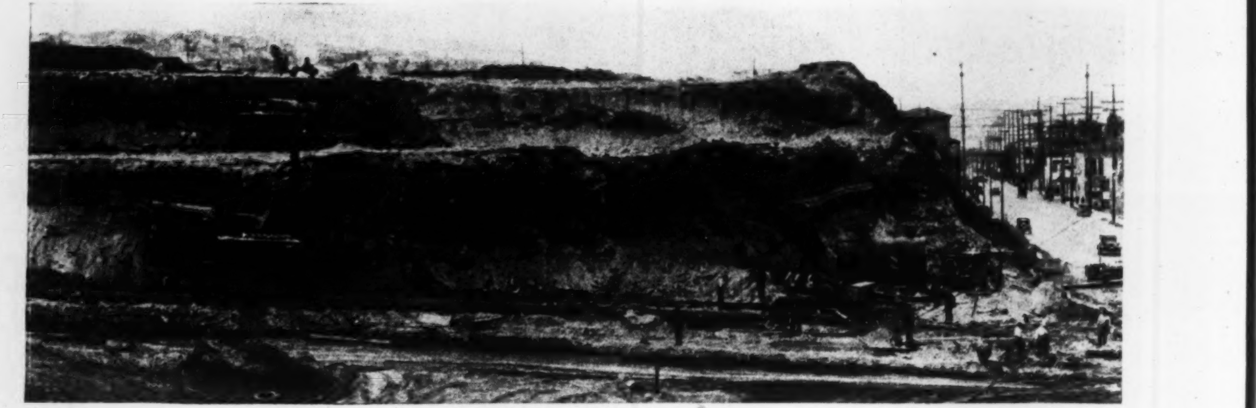
A very notable result of rainy weather has been the longer time required to shift the portable conveyor units. In fair weather a 250-ft. conveyor section is shifted easily in one hour or less, while on a muddy field with the same crew, this time is lengthened to two hours solely by the reduced efficiency of the men when required to work in the rain on a slippery muddy surface.

The worst conditions on the belt occur when there is a slight mist, which dampens the belt and furnishes just sufficient moisture to produce a doughy consistency in the transported material, which then sticks to the belt in the form of a layer or coating. To combat this condition scrapers or "swipes" made of rubber belting have been devised. These are supported at the head pulley just beyond the point where the material is delivered from the belt and have been quite successful in scraping mud that adheres to the belt beyond the discharge point. During misty weather the return rollers also become coated with a layer of the sticky mud and require frequent cleaning.

Temperatures during most of last winter were unusually low, and rainfall also was below normal. The cold weather was sufficiently prolonged to freeze the ground to a depth of 18 in. This freezing was noted particularly in subgrading or shallow digging, which produced lumps of frozen material too large to go through the grizzlies of the loading hoppers. These lumps had to be piled up behind the shovels until they thawed out, an operation that occasioned some delay. Frost had no effect on the excavation where the shovels were digging against a vertical face.

*Equipment Performance*—A careful check of equipment on the job indicates that it is withstanding the wear well. The first and longest of the three conveyor-belt sections, about 1,500 ft. long, has been renewed. All other belts, the contractor believes, will more than last through the job. The portable belt-conveyor sections, of which there are eighteen, are found to withstand rough treatment very effectively.

Each of these portable sections is made up of ten 24-ft. rigid frames with about 2-ft. spaces between. These interspaces are used to tighten the belt for oper-



ELECTRIC SHOVELS AT WORK ON VERTICAL FACES
Note loading hopper on wheels at each shovel.

ation or to loosen it up to facilitate moving. A section may, and usually does, have several angle points in a vertical plane; the plane alignment is not so important to efficient operation as was anticipated. However, the horizontal alignment must be nearly perfect. The portable sections work well on grades up to 6 per cent. Beyond that, trouble is likely to result, and 10 per cent seems to be about the maximum grade on which they will operate.

The loading hoppers, intermediate between the shovels and the portable conveyors, have caused little trouble and during the job as a whole have functioned very well. They afford, perhaps, as ideal an arrangement as it would be possible to devise. The area of the grizzly is 12x14 ft., and little difficulty is encountered in dumping the dippers. The time that would be lost in spotting trucks and muck-cars is eliminated. The only point of disadvantage, as compared to the older system of handling earth, is that the size of dirt lumps that will go over the belt nicely is limited to approximately 1 cu.ft. in size. This is what determined the spacing of the bars in the grizzly. At times the shovel dippers are used to mash lumps of relatively soft material through the grizzlies.

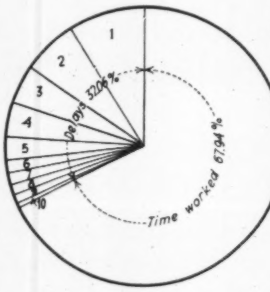
*Operating Costs*—There are four 2-cu.yd. electric shovels and one 1½-cu.yd. steam shovel loading onto the portable conveyors. These shovels, when operating without delays, will load a maximum of 1,000 cu.yd. (bank measurement) per hour. The job average, however, is about 395 cu.yd. per hour elapsed time, or 575 cu.yd. per hour time actually worked by shovels. The maximum output with five shovels working three eight-hour shifts has been 14,300 cu.yd.

These shovels have proved satisfactory and appear to be well adapted for this purpose. When working in some of the materials, particularly the blue clays, there is a certain percentage of wetness at which the dippers will not clear themselves readily in the dumping process and part of the material remains in the dipper. The electric shovels do not seem to be able to shake lodged material from the dipper teeth as well as the old steam shovels did.

In a pioneer operation of this character a certain amount of delay is inevitable. By careful and attentive supervision, however, lost time has been reduced to a minimum. The distribution of all delays from beginning of contract to March 1 are shown graphically in the accompanying circular diagram.

The power consumed by the electric shovels for the entire job to date has been 0.54 kw.-hr. per cubic yard. The minimum figure for a fair day's run has been as low as 0.37 kw.-hr. per cubic yard (bank measurement). The power required to operate all belt conveyors has amounted to approximately 0.5 kw.-hr. per cubic yard (bank measurement).

Each shovel crew consists of a shovel runner and a ground man. All portable conveyors are moved by a crew of fifteen men with the assistance of a tractor and the tractor crew of five men. These twenty men do all the shifting for the three portable conveyor systems. The work is carried on at a rate of three eight-hour shifts per day, six days per week. One operator is assigned to each 250-ft. portable conveyor section, thus making up a grand total of 33 men per shift or 99 men for the three daily shifts. In addition to these men there is a mechanical crew of six men which works only during the day shift.



| Chart Number | Cause of Delay | Per Cent of Total Time |
|---|---|---|
| 1 | *Repairs to shovels* | 8.72 |
| 2 | *Dumping scow* | 6.84 |
| 3 | *Portable conveyors down* | 4.28 |
| 4 | *Main conveyor down* | 4.18 |
| 5 | *Time for oil and lunch* | 2.38 |
| 6 | *Moving portable conveyor* | 1.54 |
| 7 | *Moving hoppers* | 1.33 |
| 8 | *Hopper feeders down* | 1.27 |
| 9 | *Moving shovels* | 1.08 |
| 10 | *Slides* | 0.42 |
| | Total Delay Time | 32.06% |
| | Time Spoil Moved | 67.94 " |
| | Total Working Time | 100.00 " |

DIAGRAMMATIC ANALYSIS OF CAUSES OF DELAY

*Contract Terms*—The material to be removed from streets, alleys and slopes totaled 2,700,000 cu.yd., while that to be taken from private property amounted to 1,500,000 cu.yd. An analysis of the entire bid on this job indicates that the contractor is receiving an average price of 31c. per cubic yard for excavating and removing the entire 4,200,000 cu.yd. This unit price is reached by taking account of the bid item of $250,000 for clearing and grubbing, which was part of the contract. It developed that material salvaged from the old houses removed from private property approximately equalled the clearing and grubbing costs.

The Denny Hill project is being carried out under the direction of W. D. Barkhuff, city engineer. The general contract is held by George Nelson & Company, of Seattle, Albert Lincoln, superintendent. The Nevada Contracting Co., Fallon, Nev., is carrying on the excavation as a subcontract.

# Highway Progress in the Dakotas and Wyoming

### Oil-Gravel Mix Adopted by All Three States as Best Surfacing Possible at Low Cost—Snow Removal Becoming Expensive Maintenance Item

OILING NORTH DAKOTA OIL-GRAVEL ROAD
Tractor at right is pulling disc-harrow to mix oil into gravel before travel has chance to pick up the oil.

MIXING OIL AND GRAVEL ON NORTH DAKOTA ROAD
Three plows in echelon formation throw gravel windrow clear across roadway; several such lateral shifts required.

APPLYING OIL TO WYOMING OIL-GRAVEL ROAD
In some parts of state where gravel is scarce, crushed limestone has been used successfully.

NORTH and South Dakota and Wyoming, in common with many other thinly populated Western states, are faced with the problem of providing thousands of miles of passable highways with comparatively little money. All three states are trying to extend the mileage of light-surfaced roads rather than to enter into an extensive paving program. The oil-gravel mix, introduced by South Dakota and Wyoming three years ago and now being tried out in North Dakota, seems to be the solution of providing a satisfactory surfacing at low cost. The oil-gravel mix has three major advantages: (1) low first cost and maintenance; (2) smooth and satisfactory surface with a life from three to five years; (3) conservation of gravel. This last advantage is very important, because, contrary to popular belief, gravel is extremely scarce and expensive in many parts of the West.

The following summaries show the amount of money available, the extent of the state highway systems, and the problems and current practices of each of the three states.

*North Dakota*—Most of the state consists of rolling prairie land, rougher in the western portion through the bad lands. The eastern end of the state lies in the Red River valley, rich farming land but with few gravel or sand supplies.

The state highway system totals 7,500 miles, classified as follows: improved earth, 1,426 miles; gravel-surfaced, 2,714 miles; sheet asphalt, 1.2 miles; concrete, 9.2 miles; oiled gravel, 102 miles; oil-gravel mix, 8 miles (just started this type of surfacing); remainder unimproved. Gravel is obtained mostly from local pits, with an average haul of 7 or 8 miles, and much of it is of poor quality.

North Dakota spends about $4,000,000 annually on the state system for construction and maintenance. Counties contribute one-fourth of the cost of new construction but nothing toward maintenance. The state has no highway bond issues; all revenue for highways comes from the three-cent gas tax, of which one cent is distributed to the counties proportioned on car registration, motor vehicle license fees and contributions from the counties. The counties usually turn their share of the gas tax back to the state as a contribution toward new construction. North Dakota refunds gas taxes on fuel for farm implements, which amounts to as much as 40 per cent of the total tax collected. Federal aid, with the recent increase, amounts to $2,005,100. From the total license fees the state deducts funds for all the state highway department administration and overhead expenses plus $130,000 for bridges and then splits the remainder of the license funds equally between the state and counties. On June 25 the voters turned down the proposition to increase the gas tax from three to four cents, by less than 1,000 votes. This action will make it difficult for the state to meet the increased federal aid allowance.

The highway department is enthusiastic about the use of the oil-gravel mix for low-cost surfacing. Present practice is to make the compacted finish 2 in. thick, using 1,000 cu.yd. of new gravel per mile of road, giving a surface 20 ft. wide. The gravel is spread on the road and bladed into a windrow along the side of the road for drying. It is spread over the road again just ahead of oiling, which is done in 10-ft. strips. Immediately behind the oiling process a tractor with two disk harrows mixes the oil into the gravel. After gravel for the entire width of road has been treated, it is bladed into one windrow along the road edge and is then mixed and turned over back and forth across the road by three motor graders traveling in echelon formation. About 30 passes back and forth across the road are required for complete mixing. After the gravel and oil are thoroughly mixed the mixture is spread over the road by a large blade grader and left for compaction by traffic. The oil is applied by pressure distributors, spreading

⅓ gal. per square yard per trip, four trips being required for a complete application. The cost of oil is about $1,500 per mile and the cost of application about $500 per mile. The cost of gravel varies considerably with the location.

Considerable success has been obtained with oiling the subgrade instead of the surface in the Red River valley, where the soil is a heavy clay. This procedure keeps moisture out of the subgrade. So far, the oil-gravel mix surface has been applied only to old gravel roads. Plans are being made to experiment with this type surface directly on top of earth subgrades.

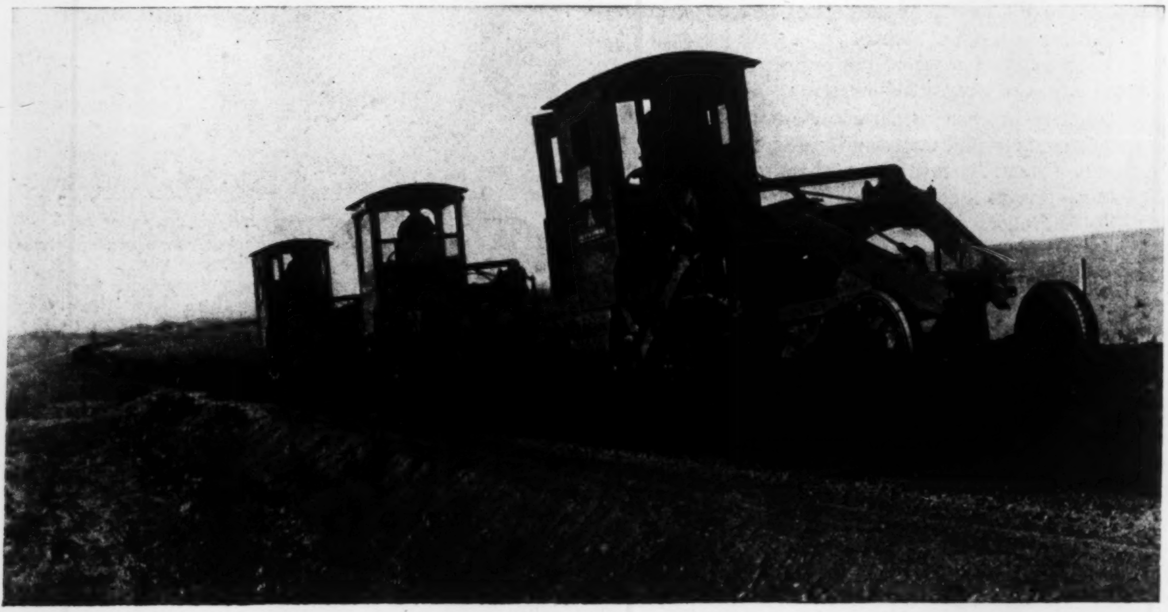
Snow removal has become an expensive and troublesome maintenance item. Many of the older roads were built with a narrow right-of-way and on a low grade to make cuts and fills balance. As a result, snow packs into the shallow cuts while the adjacent lands are swept clean. Practice now is to keep the road grade higher than the adjoining land, enabling the wind to keep the roads free of snow. The high winds that prevail in the state complicate snow removal. The first scraping off of snow forms ridges along the road, which further aggravates drifting. Three different types of snow-removal equipment are used: blades on the front of high-speed trucks for light snows; graders and plows handled by heavy tractors; and rotary plows. The rotaries are proving very satisfactory, as they throw the snow clear of the right-of-way and far enough from the road to prevent the formation of drift ridges. More than $160,000 was spent last winter for snow removal.

A complete testing laboratory is maintained by the state at Bismarck. All road oils are tested and all gravel supplies are analyzed to determine the amount of oil or clay binder needed. H. C. Frahm is chief engineer and C. A. Myhre is assistant chief of the state highway department.

*South Dakota*—About $13,500,000 is spent annually for highways is the state. The state highway system consists of 6,000 miles of roads, of which 4,000 miles has been surfaced, mostly with gravel. Expenditures by the state total $5,500,000, including $2,000,000 for maintenance. The counties spend $6,000,000 annually, and the townships another $2,000,000. Revenue for the state system is derived from the four-cent gas tax and from motor-vehicle license fees. One cent of the gas tax goes for the retirement of a $6,000,000 bond issue which was floated at the start of the federal-aid plan several years ago. This bond issue will be retired by the end of this year so that the state highway engineer hopes to have the one-cent share of the gas tax available to meet the increased federal aid. At present, federal aid amounts to $1,200,000 and will reach $2,000,000 with the increase. Approximately one cent of the gas tax is refunded because of agricultural use. The counties and state share equally the license fees. The remainder of the county revenue is raised by road tax levy, and the counties receive some state aid.

A COMPLETED WYOMING OIL-GRAVEL ROAD

The state has three classes of highway conditions to meet. In the eastern portion of the state, around Sioux Falls, Sioux City, Aberdeen, Huron and Yankton, there is a heavy truck traffic. Thousands of truckloads of stock move into the Sioux City packing plants from southeastern South Dakota. Between Mitchell and Huron and the Black Hills there exists a wide expanse of prairie and bad lands, thinly populated but requiring passable roads the year around. As a result, there is much difficult mountain construction and maintenance.



GRADER TRAIN MIXING OIL-GRAVEL ON WYOMING ROAD
Note that roadway is graded high to prevent accumulation of snow.

About 50 miles of road, all in the eastern portion, has been paved. Wire-mesh reinforcing is used on all paving projects. A 5-mile paving program between Deadwood and Lead in the Black Hills, proposed for this year, has been abandoned because of a considerable subsidence of the highway caused by old mine workings.

For the past three years the state has experimented with the oil-gravel mix surface. Primarily, this type of surface has been used in the central and western parts of the state, where traffic is light. A stretch of heavily traveled road in the eastern section was treated with oil surface to see how it would stand up, but the results were not satisfactory. But on the long stretches of prairie roads where traffic is light the oil-gravel mix seems to be the ideal surface obtainable at low cost. The cost of oiling approximates $2,000 per mile exclusive of the cost of gravel. The method of application is practically the same as that employed in North Dakota. South Dakota is also surfacing some of the oil-mix roads with cutback asphalt, with satisfactory results. The asphalt treatment is successful in preventing the gravel from raveling.

There are more than 3,000 miles of graveled roads in the county systems in the eastern portion of the state. In the whole state there are 19,000 miles of county roads and 95,000 miles of township roads. All revenue for township road construction and maintenance comes from local taxes.

More than $100,000 was spent for snow removal last winter. J. M. Brown is state highway engineer.

*Wyoming*—The State of Wyoming, with nearly 100,000 square miles of area and with a population of slightly more than 200,000, has a most serious problem of building and maintaining roads with little money. The state has a four-cent gas tax, of which one cent goes to the counties. Last year the state's share of the gas tax amounted to $1,024,000. This fund is used for maintenance only. Federal aid amounts to $940,000 under the old schedule, with an additional $630,000 expected under the recent increase. License fees, amounting to $670,000, all go to the state. The state highway department receives part of the federal oil royalties, amounting to approximately $275,000. The state has just finished paying off a highway bond issue of $2,800,000. Another issue of $2,800,000 was approved at the recent election. It will be used by the state to meet the increased federal aid appropriation.

There are 3,100 miles in the state highway system, of which 65 per cent has been surfaced. All of the system is under maintenance. The standard surface is gravel or oil-gravel mix. A base course of gravel is placed on the road and allowed to remain for a full year before the final gravel or oil-gravel surface is placed. The standard oil-gravel mix is 3 in. thick spread over a width of 20 ft. The amount of oil used varies with the proportion of fines in the gravel, varying from 1.6 to 2.2 gal. per square yard of surface. Application is made by mixing on the road. This is similar to the process used in North Dakota.

Most of the highway traffic in the state is light except around the Casper and Salt Creek oil fields. A short stretch of paving has been placed in the oil fields near Casper, the only paving in the state. Gravel supplies vary greatly throughout the state, requiring an average haul of 7 or 8 miles. Oiling is now progressing where the gravel is expensive or scarce, as the oil-gravel mix is considered the best way to preserve the gravel surface. On the Salt Creek road gravel was hauled 30 miles, costing $9 per cubic yard in place. The average cost of 6-in. gravel base is $4,200 per mile, and the oil is applied for $1,800 per mile, exclusive of the cost of gravel in the mix. In some parts of the state where gravel is scarce crushed limestone has been successfully used in the oil-mix process. In other locations where a tight gravel base is obtained the oil-penetration process has been used. At the beginning of the year 192 miles of road had been treated with oil surfacing and this year's program will see an additional 126 miles treated. Previous to this year all oiling was done by the state, but this year 40 miles of road is being oil-treated by counties.

Wyoming has also successfully surfaced 25 miles of road with an oil-sand (natural soil) mix. In other places where blow sand is troublesome oiling has been found to keep the sand surfacing in place.

By the end of next year there will be no grade crossings on the entire length of the Lincoln Highway through the state, a distance of 440 miles. By relocation and the construction of seven structures, seventeen grade crossings on this main trunk line will have been eliminated. The state and railroads share equally the cost of grade separations.

Wyoming has pioneered in snow prevention on its highways. All roads are built a minimum of 2 ft. above the surrounding country where possible, to allow the wind to sweep the surface. Wide ditches with 100-ft. right-of-way are standard. Cuts are widened out to right-of-way lines, 96 ft. wide across top of slopes, except in solid rock. Borrowpits are located on the windward side of the road to provide reservoirs for snow. Snow fences similar to those used by railroads are placed along deep cuts.

Last winter the state removed snow on 2,630 miles of road at a cost exceeding $105,000. Truck plows, tractor plows and blades on high-speed trucks are all used. Once the snow-removal crew was stalled far from help and was aided by a rescue crew in an airplane. Z. E. Sevison is state highway engineer.

## Strength of Poles

In the design of pole lines to carry electric wires or cables, it is customary to use working stresses for poles of green or soaked wood, and a report on tests at the U. S. Forest Products Laboratory, Madison, Wis., indicates that this practice is correct. It is true that when the moisture has decreased below the fiber-saturation point, which is about 25 per cent of the moisture content, there is a marked increase in most of the strength properties of the wood. But for pole lines it is assumed that although the poles may have gained strength through seasoning before installation, they will become sufficiently wet near the ground line to raise the moisture content above the saturation point and thus lower the strength correspondingly. That such excess moisture does occur near the ground line of poles and fence posts at least during part of the year and in practically all parts of the country is shown by the report. The calculated point of maximum stress in a pole is often above the ground line, but experience shows that failure is most likely to occur at the ground, so that it is advisable to take the working stress which conforms to the wet condition of the wood at the ground line.

# Combining Steel and Concrete Framing to Effect Economy

### Two Types of Steel Columns Support Concrete Columns in Chicago Office Building—Two-Way Reinforced Floors

AN UNUSUAL combination of three types of structural framing in the 27-story Buckingham Building, 59 East Van Buren St., Chicago, includes built-up steel columns of two different types, with both steel framing and concrete-beam framing, and also reinforced-concrete columns with concrete-beam framing. The purpose of this combination was partly to effect economy and partly to keep the column sizes within prescribed limits. A somewhat similar combination in a 30-story building was noted in *Engineering News-Record*, Dec. 19, 1929, p. 969.

Property conditions at the site of the Buckingham Building affected the foundation design. This building has a street and alley frontage of 91½ ft. and a depth of 97½ ft., with a public alley along the east side and a private alley in the rear. Adjacent to its west side are two buildings, the land under the north 40 ft. of this property having the same owner as the Buckingham Building, while the remainder is controlled by other parties. With this ownership and a party-wall agreement with the owners of the other property, all the foundation piers on the west or party-wall side were placed on the property line and designed to carry two rows of columns for the adjacent walls. At the dividing line between the two portions of the adjoining property, however, a larger pier was built, to carry three wall columns; one for the Buckingham Building, one for a new building which the same owner may build on his part of the property and one for a future building which may be erected on the property of the other owner. All piers were carried down to rock at a depth of about 105 ft. below street grade. The first basement extends over the entire area of the building, with a smaller sub-basement for the boiler room. The high point of the roof is 300 ft. above the sidewalk.

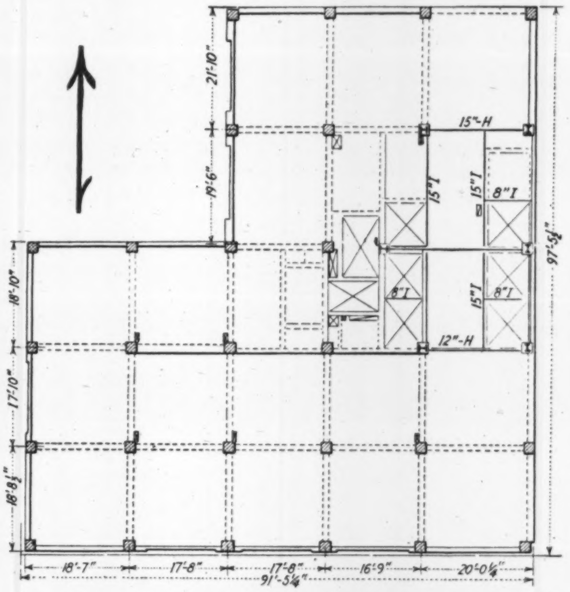
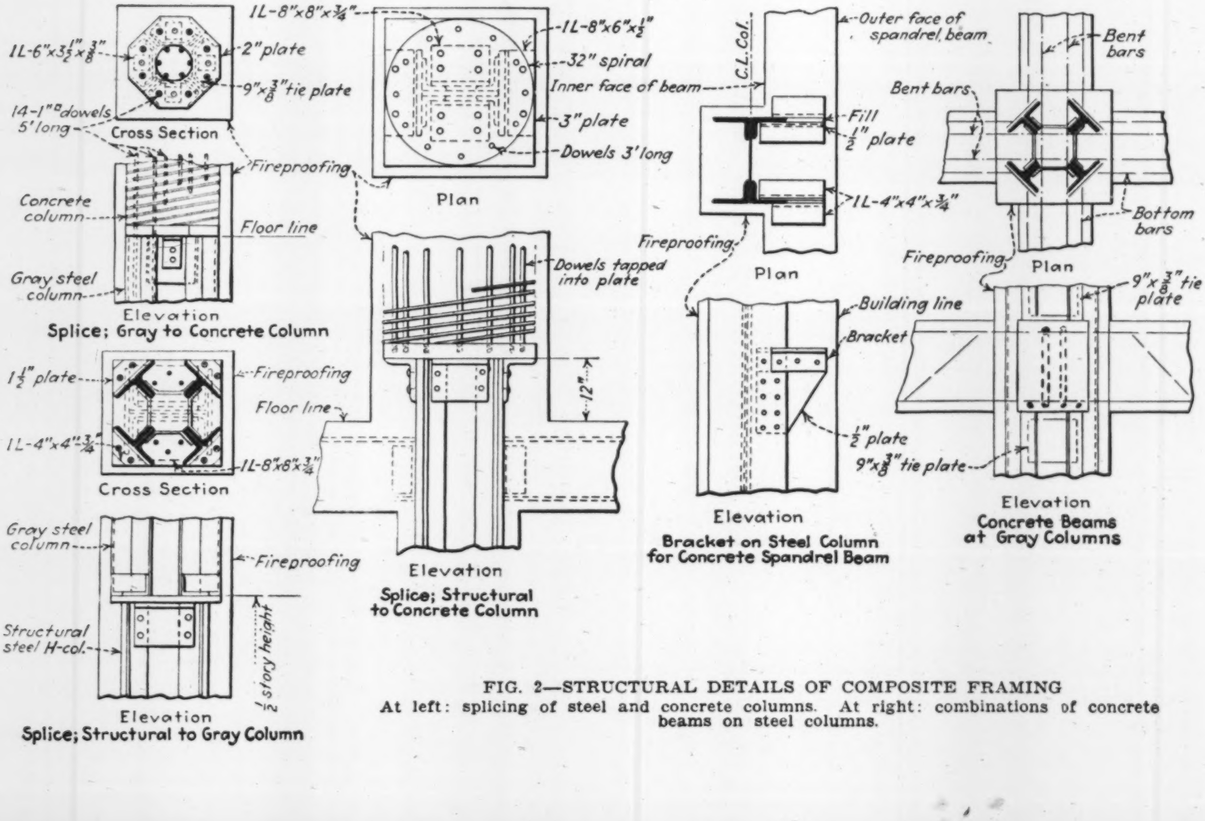

21'-10"
19'-6"
18'-10"
17'-10"
18'-8½"
15"-H
15"I
15"I
8"I
8"I
15"I
8"I
12"-H
97'-5½"
18'-7"
17'-8"
17'-8"
16'-9"
20'-0¼"
91'-5¼"

FIG. 1—FRAMING PLAN OF BUCKINGHAM BUILDING
Concrete framing of twelfth and upper floors. Similar layout with steel in lower floors. Note six continuous steel columns around utility space.


1L-6"x3½"x⅜"
2" plate
9"x⅜" tie plate
14-1"□ dowels 5' long
Cross Section
Fireproofing
Concrete column
Floor line
Gray steel column
Elevation
1½" plate
Fireproofing
Floor line
1L-4"x4"x¾"
1L-8"x8"x¾"
Cross Section
Gray steel column
Fireproofing
Structural steel H-col.
½ story height
Elevation
1L-8"x8"x¾"
1L-8"x6"x½"
32" spiral
Inner face of beam
3" plate
Dowels 3' long
Plan
Dowels tapped into plate
12"
Elevation
C.L. Col.
Outer face of spandrel beam
Fill
½" plate
1L-4"x4"x¾"
Fireproofing
Plan
Building line
Bracket
½" plate
9"x⅜" tie plate
Elevation
Bent bars
Bent bars
Bottom bars
Fireproofing
Plan
9"x⅜" tie plate
Elevation

**Splice; Gray to Concrete Column**

**Splice; Structural to Gray Column**

**Splice; Structural to Concrete Column**

**Bracket on Steel Column for Concrete Spandrel Beam**

**Concrete Beams at Gray Columns**

FIG. 2—STRUCTURAL DETAILS OF COMPOSITE FRAMING
At left: splicing of steel and concrete columns. At right: combinations of concrete beams on steel columns.

*Steel and Concrete Columns*—As far as the eleventh floor there are built-up columns of H-section, each composed of a web plate, four angles and two cover plates. These columns are of constant or uniform dimensions throughout, 16x16 in. in section. Above the eleventh floor the interior columns are also of steel, but of the Gray type, to the eighteenth floor, above which are spirally reinforced-concrete columns. At the rear of the building, reinforced-concrete exterior wall columns were used, starting at the eleventh-floor line. The remainder of the exterior columns are of the same construction as the interior columns.

Six columns at the utility space for elevators, stairways, pipe stacks, etc., are of the structural steel H-section for the complete height of the building. This was necessary partly because these columns have to support heavy steel girder framing for the elevator machinery and partly because it was not found possible to design reinforced-concrete columns and framing of adequate strength without encroaching upon the space limits of the utility section. The concrete casing of the H-section steel columns has maximum dimensions of 24x24 in., and in order to keep all other columns within these dimensions it was necessary to use Gray-type columns to such heights that reinforced-concrete columns of the same size could carry the loads. The plan, Fig. 1, shows the typical concrete framing for the floors from the twelfth to the twenty-third, and shows also the location of the six continuous steel H-columns with their steel framing. In the steel-frame floors, the arrangement of beams and panels is identical with that of the concrete-frame floors.

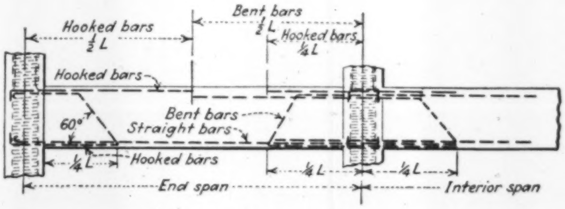
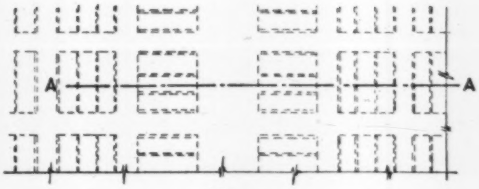


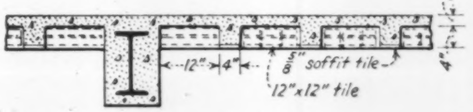
FIG. 3—WINDBRACING FOR CONCRETE FRAME

With columns varying in design at different heights, special methods were required for connecting or splicing the different types of steel and concrete columns, as shown in Fig. 2. Each interior H-column extends to a point midway between the eleventh and twelfth floors, and the top has a 1½-in. cap-plate on angle brackets. The Gray steel column is seated on this plate and has shoe angles which are riveted to the plate. These interior Gray columns in turn end at the eighteenth floor, with a 2-in. octagonal cap-plate provided with holes so that dowels of reinforcing bars 5 ft. long could be inserted, projecting 2½ ft. down into the concrete filling of the steel column and 2½ ft. up into the concrete column above it. These dowels serve as splices for the reinforcing bars of the concrete column. Where the exterior steel H-columns are spliced directly to reinforced-concrete columns, the steel column was carried to a point 1 ft. above the floor line and was capped with a 3-in. plate or slab, into which were tapped the threaded ends of 3-ft. rods, which serve as splices for the reinforcing bars of the superimposed concrete column.

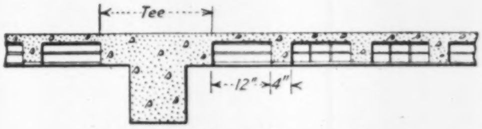
An interesting point in regard to the H-section built-up columns, is that they were fabricated in a multiple-drilling machine which can drill 96 holes simultaneously in the web and flanges. The members are assembled and clamped on a table which travels forward in strokes of 2 ft., feeding the column between three sliding drill carriages, one on each side and one above, each carriage having 32 drills.



Plan



Section A-A with Steel Beams



Section A-A with Concrete Beams

FIG. 4—CONCRETE FLOOR WITH TWO-WAY REINFORCING

*Floor Framing*—The floor framing is practically identical throughout the building and its typical layout is shown in Fig. 1. In the upper floors with concrete framing some steel beams are required, especially around the elevators, where concrete beams would have been too large. Where concrete spandrel beams frame on the steel H-columns, these beams are supported by angle brackets riveted to the outside flanges of the columns. Where interior concrete beams frame into the steel Gray columns, the reinforcing bars are threaded through the column, as is also shown in Fig. 2, the beam being supported on shelf angles riveted to the column.

Windbracing in the steel framing consists of the usual type of gusset-plate connections between columns and spandrel beams. In the concrete portion of the building it consists of special reinforcing with straight and bent bars designed for the wind moment in the girders and hooked into the columns. The arrangement is shown in Fig. 3.

A two-way reinforced-concrete floor of the tile-and-joist type, Fig. 4, is another special feature in this building, and is used with both steel and concrete framing. Joists in both directions form a cellular construction with hollow tile filling in the rectangular spaces. Flat pieces of tile are placed under the concrete joists, being supported by dovetailed grooves in the filler tiles, so that there is a continuous tile surface for the ceiling plastering. The floor slab over the filler tiles is 2 in. thick and the depth of tile is 4 in. Advantages claimed for this type of floor construction are shallow depth and low dead load.

The Buckingham Building was designed by Holabird & Root, architects and engineers, with V. O. McClurg as chief structural engineer. The Lundoff-Bicknell Co. was the general contractor, and the Inlan Steel Co. fabricated the structural steel work. Some of the features of rapid construction were noted in *Engineering News-Record,* March 27, 1930, p. 532.

# Developing a Paved Invert Culvert Pipe

**Original Idea From Field Studies of Pipe—Paving Material a Result of Field Studies and Laboratory Tests—Behavior of Paving in Service Determines Thickness and Width**

THE PAVED-INVERT pipe is a relatively recent development in the field of culvert and drainage practice. The embryonic idea that some sort of paving would be useful and economical to resist erosive action resulted from extensive field studies that the Armco Culvert Manufacturers' Association inaugurated and is continuing on the service performance of all types of culverts. The investigation of hundreds of old culverts in numerous states revealed that the invert was the first part of the pipe to show deterioration of the material and indeed was often destroyed by the scouring action of sand and grit while the crown was still good.

As an example of the information developed by these field studies, the situation in one state may be cited. In that state 92 per cent of the culverts examined were affected by erosion only in the bottom half. The actual summary was as follows: 76 per cent were affected only in the lower third; 16 per cent were affected only in the lower half; 5 per cent were affected only in the lower three-quarters, only 3 per cent were affected over the complete circumference.

Incidental information relative to the manner in which the damage occurs was also revealed by these studies. In corrugated metal pipe, for example, the first indication of wear appears on the upstream side of the corrugations, in the wearing away of the galvanizing. The Armco engineers reasoned that the next step, the formation of an oxide film on the base metal, was really a phenomenon of corrosion. Unlike corrosion, however, this oxide film does not grow thicker and thus offer some protection to the base metal, as would be the case if the metal were exposed to atmospheric conditions alone, but is washed off by scour of water and grit, again exposing the base metal. An oxide film is again formed, which is in turn scoured off, and the cycle repeated. With each cycle of corrosion and erosion some damage is done to the invert.

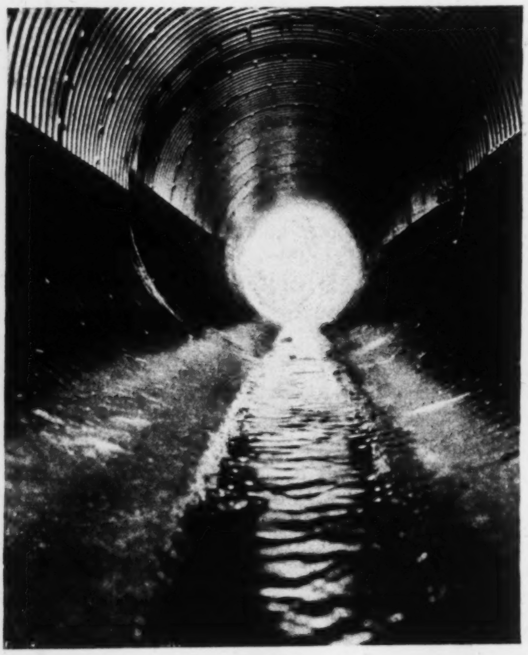
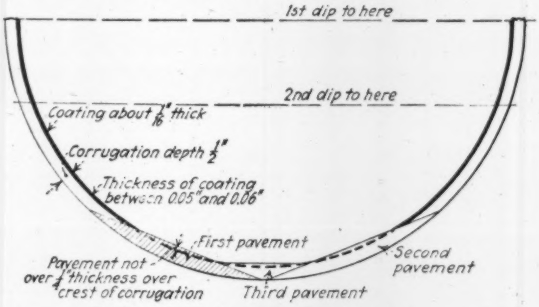
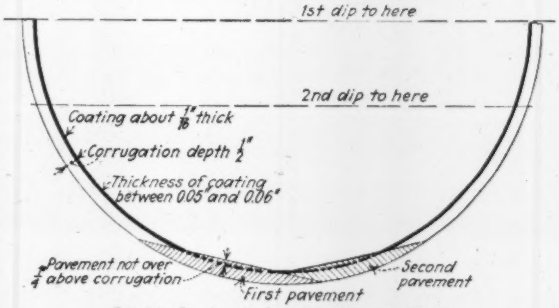


FIG. 1—PAVED INVERT CULVERT PIPE
This is a 48-in. diameter triple-paved pipe near Augusta, Ga.

A natural outgrowth of these investigations was the determination to develop a more balanced design of culvert pipe—that is, one in which the entire periphery would have approximately the same length of life. Engineering structures subjected to loads are developed under a plan of balanced design—nearly uniform strength throughout—and it seemed only logical that structures subjected to hazards of material deterioration instead of structural failure would be most economical if developed in accordance with a similar theory. Such a theory is, in fact, behind the design of the automobile tire, for example, which is largely made up of fabric but is reinforced on the wearing surface with a wear-resisting tread.


1st dip to here
2nd dip to here
Coating about $\frac{1}{16}$" thick
Corrugation depth $\frac{1}{2}$"
Thickness of coating between 0.05" and 0.06"
First pavement
Second pavement
Pavement not over $\frac{1}{4}$" thickness over crest of corrugation
Third pavement

Triple Paving in Large Diameter Pipe


1st dip to here
2nd dip to here
Coating about $\frac{1}{16}$" thick
Corrugation depth $\frac{1}{2}$"
Thickness of coating between 0.05" and 0.06"
Pavement not over $\frac{1}{4}$ above corrugation
Second pavement
First pavement

Double Paving in Smaller Diameter Pipe

FIG. 2—PAVING PRACTICE ON LARGE AND SMALL CORRUGATED CULVERT PIPE
Note how bottom is troughed and how asphalt extends in decreasing thickness to horizontal diameter.

*Reinforcing the Invert*—Various methods of developing a more wear-resistant culvert invert were tried. These included the use of a bottom segment of heavier gage metal, a heavier coat of galvanizing and various paints. The heavier gage metal in the bottom segment proved expensive and added to fabrication difficulties and costs out of all proportion to the benefit derived. The use of 10 oz. of spelter per square foot, instead of the usual 2 oz., provided only a 10 per cent increase in erosion resistance. The various paints tried were of practically no value.

An asphalt coating was next considered. Extensive studies were undertaken, since none of the asphalt manufacturers had any data regarding the value of their products to resist erosion. Their only previous concern had been with the use of asphalt as a preventive of corrosion. The preliminary tests indicated that some sort of an asphaltic preparation would provide a fairly satisfactory protection. Accordingly, every available bituminous material was subjected to four principal tests, as follows:

(1) The ability of the coating to withstand shock was tested by dropping a steel ball, 2¼ in. in diameter and weighing 1.67 lb., from a height of 7½ ft. through a 2½-in. inside diameter vertical tube upon the outside crest of a coated corrugation of a full round, riveted section of culvert pipe, with the specimen at a temperature of 30 deg. F. Failure of the coating on the inside of the culvert pipe, as indicated by spalling from the metal or the formation of cracks longer than ½ in. from the point of impact, was considered sufficient cause for rejection.

(2) Stability of the coating when hot was tested by drawing parallel lines along the crest of the corrugations and placing the specimen on end in an oven with a constant temperature (within 2 deg. of 150 deg. F.) with the line of corrugations horizontal. At the end of four hours no part of any line on an acceptable material must have dropped more than ¼ in.

(3) The imperviousness of the coating was determined by placing a 25 per cent solution of sulphuric acid, or a 25 per cent solution of sodium hydroxide, or a saturated salt solution in a valley of a coated corrugation for a period of 48 hours, during which time no loosening or separation of the coating from the galvanizing must have taken place.

(4) Abrasion resistance—the most important test—was determined in an erosion machine, similar to that shown in Fig. 3D, designed to simulate service condi-

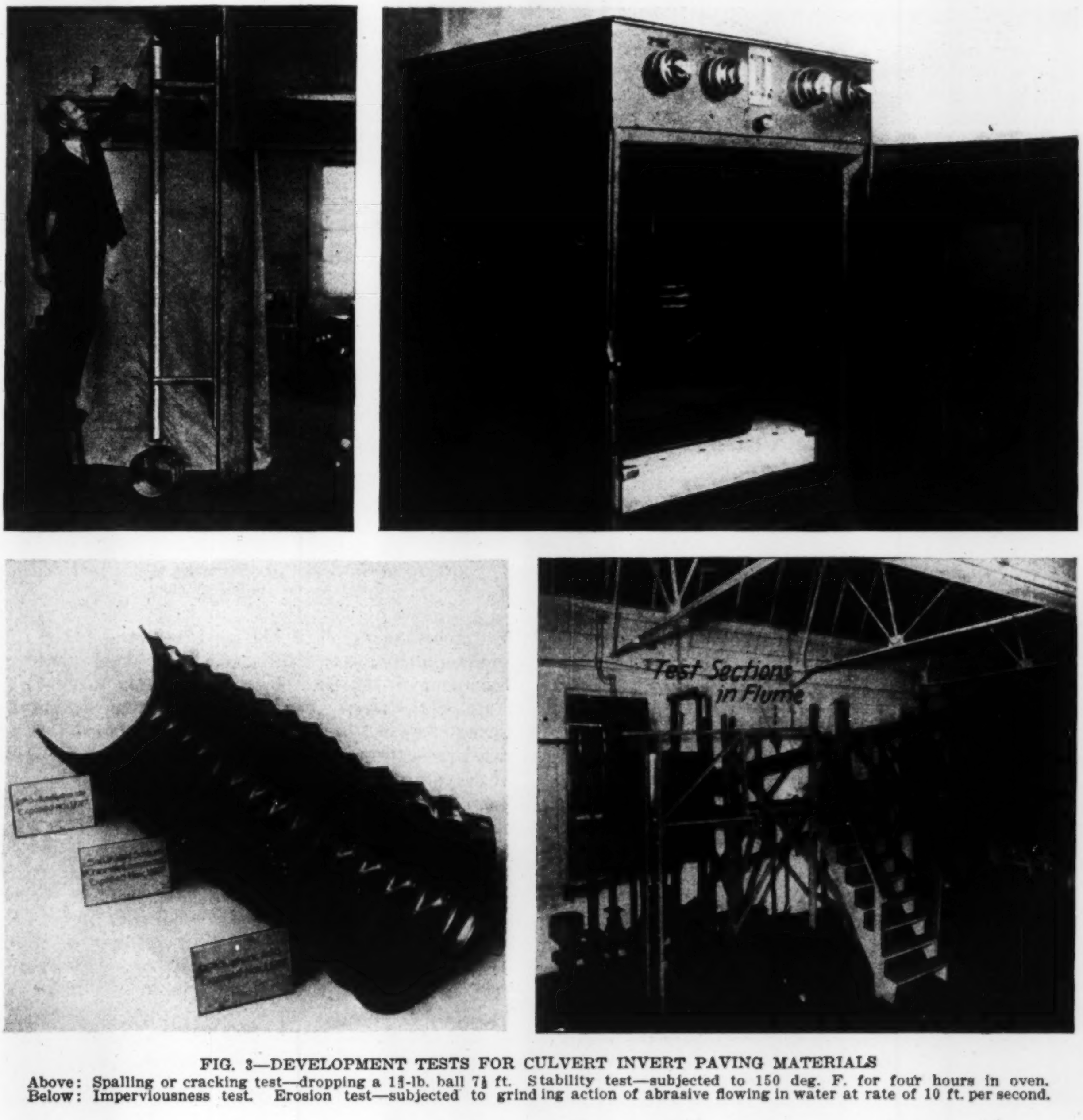


FIG. 3—DEVELOPMENT TESTS FOR CULVERT INVERT PAVING MATERIALS

**Above:** Spalling or cracking test—dropping a 1⅔-lb. ball 7½ ft. Stability test—subjected to 150 deg. F. for four hours in oven.
**Below:** Imperviousness test. Erosion test—subjected to grinding action of abrasive flowing in water at rate of 10 ft. per second.

tions. Coated test specimens were placed in the flume and sealed together, with alternate sections only zinc-coated. Through these sections for at least half their depth, at an approximate velocity of 10 ft. per second, flowed water which maintained in motion the maximum amount of an abrasive. Any test section was deemed to be a failure when the zinc beneath the coating was first exposed; and the zinc-coated section was recorded as a failure when the base metal first was exposed by the following test: A spot suspected of failure is treated with a drop of neutral copper sulphate solution (30 per cent) and wiped dry immediately. If the base metal has been exposed, that base metal will be copper-plated. Failure of either end corrugation of any specimen is not considered in this test.

With a uniform grade of sharp sand used as an abrasive, 116 different bituminous materials were tested, with the following results, in hours:

| | |
|---|---|
| Life of best material | 4,440 |
| Life of next best | 2,740 |
| Life of third and fourth | 2,610 |
| Life of poorest | 6 |
| Average life of zinc coating | 60 |

It is interesting to note that the best asphalt lasted more than 50 per cent longer than the second best. Later, as more materials were tested, sand was replaced by an aluminum oxide abrasive, 16 to 20 grain in size, of which grinding wheels are made.

The best asphalt selected was not entirely satisfactory in the shock and oven tests, so research was concentrated on it for almost a year to develop the material which is now in use on this product.

Within the past two years the total number of asphalts tested has been increased to 200, with the result that none has been found which is superior to that adopted in 1925. Studies, however, are continuing.

In the early development, it was found that a flat smooth pavement of the bituminous material greatly increased abrasion resistance. This was obtained by filling the corrugations at the bottom, producing a single pavement invert. Studies of such a pipe in service revealed that an increase in the thickness and extent of the paving was desirable, and a double pavement was instituted. At the present time large diameter pipes are triple paved.

By manipulating the manufacturing process the thickness of the coating is varied from a maximum at the bottom of the invert to a minimum at the horizontal diameter. Where formerly there was only one flat pavement in the bottom, the invert is now formed in the shape of a trough with either two or three pavements, as shown in Fig. 2.

By successively increasing the thickness of the protection, the point of initial deterioration has been raised from the bottom of the pipe to the sides, where the erosive action is less severe. It is, therefore, believed that the pipe as now paved represents a balanced design, which can only be improved when the results of further service and field studies now under way are available.

At the present time there is the equivalent of approximately 2 million feet of average 18-in. paved invert culvert pipe in service. Observation of a large number of these installations seems to justify the hope of the developers of paved invert pipe that by this design a way will be found for overcoming a condition which shortens the life of culverts.

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# Pneumatic Caisson Foundations for Japanese Bridge

### Six-Span Concrete-Arch Bridge Has Piers Sunk Through Sand and Gravel —Plant and Methods of Working

By J. Masake
*Division Engineer, Bandai Bashi, Niigata, Japan*

A HANDSOME concrete-arch bridge with stone facing has been built to replace an old wooden bridge across the Shinano River at Niigata, a city on the north side of the main island of Japan. This city is itself on an island, surrounded by the river and the Japan Sea. In 1885 a wooden bridge was built by T. Yagi, a benevolent gentleman, at his own expense. It was 2,580 ft. long and 24 ft. wide, but was destroyed in 1908 by a fire which consumed half the city. It was rebuilt on the old pile piers by order of the prefectural council.

With increasing traffic the cost of maintenance increased correspondingly, and in 1925 it was decided to replace the old structure with a concrete-arch bridge at an estimated cost of $1,200,000, two-thirds of the expense to be contributed by the national treasury. Prof. Y. Tanaka, of the Imperial University of Tokyo, was appointed to prepare the design. In view of the completion of regulating or flood-protection works on the Shinano River, it was decided to reduce the width of the channel by 900 ft.

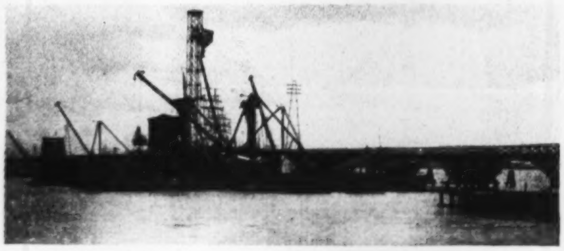


FIG. 1—BRIDGE FOUNDATION PLANT, NIIGATA
Old wooden bridge at right.

This new bridge, Fig. 2, consists of six spans of hingeless arches, two each of 154 ft., 151 ft. and 142 ft.; in addition, there are two 48-ft. two-hinged land spans. A headroom of 18½ ft. at low water is sufficient for the craft on the river. For effective appearance a granite facing is applied to the concrete and the parapets are of cast-iron lattice work in granite frames. Hinged panels of the parapet on each span provide for discharging snow from the bridge.

A total width of 72 ft. includes a central 18-ft. granite-paved space for the electric railway, two 15-ft. roadways paved with asphalt blocks and two 12-ft. sidewalks paved with concrete blocks. The new filled approaches, including street widenings, are 90 ft. wide, with 15-ft. sidewalks, 18-ft. railway space and 42-ft. roadway, all paved as on the bridge. Water and gas mains and electric conduits are placed under the sidewalks on the bridge and under the roadway in the streets. At present, the daily traffic (24 hours) includes 12,000 pedestrians, 1,050 rickshas, 800 bicycles and motorcycles, 1,200 wagons, 2,200 automobiles and 360 motor trucks.

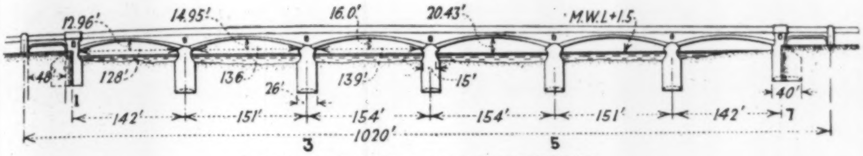


FIG. 2—DESIGN OF NEW BRIDGE

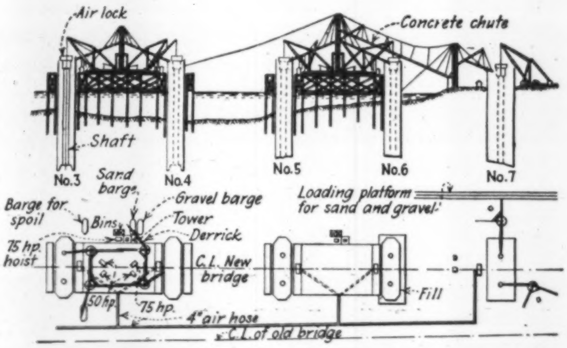


FIG. 3—TYPICAL LAYOUT OF CONSTRUCTION PLANT

*Foundation Work*—Borings showed the riverbed to be composed of layers of fine and coarse sand to a depth of 80 ft. below water. It was decided to use pneumatic caissons for the abutments and piers of the main bridge and pile foundations for the abutments of the two land spans. Sand from the caissons was used in the concrete, with river gravel for the coarse aggregate and Japanese portland cement. Electric current was furnished by the local electric company, independent transmission lines from different power stations being provided to insure a continuous supply.

For the safety of the compressed-air workers, or sandhogs, three physicians were engaged, and a hospital lock was provided to treat cases of caisson disease. The workmen, between 18 and 36 years of age, were required to pass a medical examination and to observe these rules: (1) to wear clean and dry clothing and have spare clothes, as decompression causes changes in bodily temperature and moisture; (2) not to take alcoholic drink or fatty food; (3) to sleep at least seven hours each night. The length of working time, depending upon air pressure, was as shown in the accompanying table. No changing of pressure was allowed for sinking or adjusting the caisson. Working platforms 72x96 ft. were built on piles, each platform serving two piers, and the construction equipment was arranged as shown in Fig. 3. Compressed air was conveyed in 4-in. gas pipes laid along the old bridge.

TABLE I—DECOMPRESSION ALLOWANCE FOR CAISSON MEN

| Gage Pressure, Lb. Per Sq.In. | Length of Shift, Hours | Time of Decompression, Minutes |
|---|---|---|
| 0 to 20 | 8 | 1 to 5 |
| 20 to 28 | 6 | 5 to 10 |
| 28 to 32 | 4 | 10 to 15 |
| 32 to 39 | 3 | 15 to 20 |
| 39 to 40 | 2 | 25 |

Four pier caissons 26x88 ft. and one abutment caisson 40x88 ft. were built to a height of 20 ft. on launching ways at the Niigata Steel Works. The cradle had wheels riding on rails and the speed of launching was regulated by a cable and 50-hp. hoisting engine. With a draft of 6½ to 7 ft. the caissons were towed to position by motor boats. Land caissons for the remaining pier and abutment were of similar design, except that the bracing was omitted. These two caissons were sunk to about 5 ft. below water level without using compressed air. Two 6-in. pumps were used for drainage and an initial air pressure of 2 lb. in the working chamber of the river caissons was sufficient to hold the doors of the locks. Fig. 4 shows one of the air locks removed to allow of extending the shaft.

For the concreting, sand and gravel bins of 50-cu.yd. capacity were built at a height of about 35 ft., with measuring boxes under them. Cement sheds and water tanks were installed on the platform above the mixer. A 75-hp. three-drum hoist served the material derrick, and a 75-hp. one-drum hoist handled the tower bucket.

Air locks were operated by 4-in. valves for the buckets and 2-in. valves for the men. It was required that all whistle signals from the working chamber should be answered by hammer signals from the lock tender. When

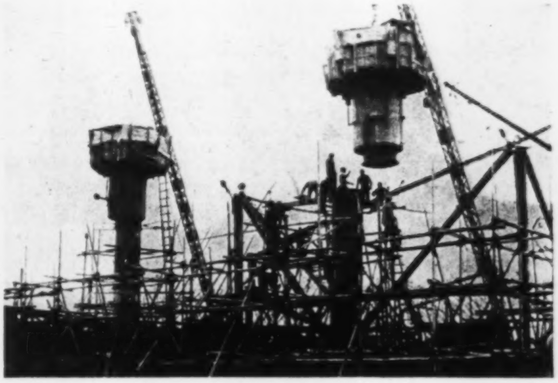


FIG. 4—HANDLING AN AIR LOCK
Note the pole scaffolding.

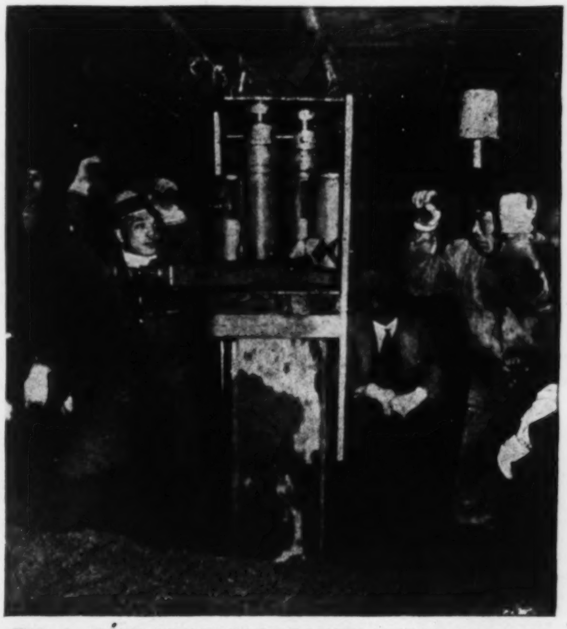


FIG. 5—TEST OF BEARING POWER UNDER CAISSON
The vertical white lines are the edges of two scales.

the caisson had reached the proposed depth a test was made of the bearing power of the ground. For this test (Fig. 5) a sump or pit was dug 2 ft. deep for a plank surface of 2 sq.ft., upon which was placed a post with cap for two oil-operated hydraulic jacks. Above the jacks blocking extended to a steel plate bearing against the roof of the working chamber. Then the bottom was leveled, the working chamber was cleaned and concreting was begun. When there was no room for the men to work they left the chamber, and concrete was sent in through both air locks alternately, the 4-in. air valves being opened for filling the corners of the caisson. With the concreting finished, air pressure was held in th shafts for about eight hours, after which they wer taken off and prepared for the next caisson. Construction was begun July 19, 1927, and completed Feb. 21 1928.

*Cost of Bridge*—The distribution of cost has been a follows: foundations, $297,700; superstructure, $493,700 approach, $139,500; removal of old bridge, $5,150 indemnity for buildings in widening the street approaches $209,300; office expenses, $54,600; total, $1,200,000 The name Bandai-Bashi, or myriad-ages, was given t both the old and the new structures.

# Concrete Control Saves Cement, Yields High Strengths and Speeds Work

### Contractor on Carew Tower, Cincinnati's Largest and Tallest Building, Proves Economy of Careful Design in Placing of Foundation and Floor Concrete

By Ernest A. Hagy and Charles T. Kennedy
*Engineers, Cincinnati, Ohio*

THE SYSTEM of design and control of concrete on the Carew Tower building, Cincinnati, Ohio, was installed by the contractor, on his own initiative, for the specific purpose of permitting speed of construction with safety. This project comprises a 48-story office building, a 30-story hotel and a 29-story garage, covering approximately 85,000 sq.ft. of ground area. The framework is of structural steel, the foundations, basement walls and floors are of reinforced concrete. The floors are of the rib and tile type, formed with metal tile and spanning 20 ft. between steel beams. The total concrete required was approximately 40,000 cu.yd.

Part of the foundation concrete was poured with two portable mixers, measurements of aggregates being made by wheelbarrows. For this part of the work sand from the excavation was used. This sand was removed to another location, passed through a ½-in. screen and hauled back to the job as required. Throughout the work standard portland cement and coarse aggregate of washed river gravel, passing a 1¼-in. screen were used.

The permanent equipment consisted of two plants, each equipped with a 1-yd. mixer, an inundator, a water tank, a volumetric batcher for the gravel and a weight batcher for the cement. The cement was received on the job in bags, which were emptied into storage bins. This arrangement for weighing the cement is very important, as it lends necessary flexibility to a plant in which changes in proportions must frequently be made.

Standard 6 by 12-in. concrete test cylinders were made throughout the job and broken by a local testing laboratory. Cylinders noted as "laboratory cured" were shipped to the laboratory the day after making and stored under standard conditions until broken. Cylinders noted as "job cured" were kept on the job without any protection. No admixtures of any kind were used.

*Strengths*—Concrete below grade was designed for a standard laboratory strength of 3,000 lb. per square inch at 28 days. The structural design called for 2,500-lb. concrete in the superstructure; higher strengths were required, however, to permit wrecking of formwork in accordance with the planned schedule. For the early part of the job, forms were removed completely, without re-shoring, in four days; later this time was shortened to three days. In the office building, 36 floors were poured in 32 working days, using 6 sets of forms.

In general, three different mixes were used, as follows:

| Mix | Cement | Aggregates | Total Mixing Water | Water-Cement Ratio | Cement, Sacks Per Yd. |
|---|---|---|---|---|---|
| A | 470 lb. | 3,175 lb. | 36 gal. | 0.96 | 5.0 |
| B | 500 lb. | 3,175 lb. | 37 gal. | 0.93 | 5.3 |
| C | 525 lb. | 3,175 lb. | 38 gal. | 0.91 | 5.5 |

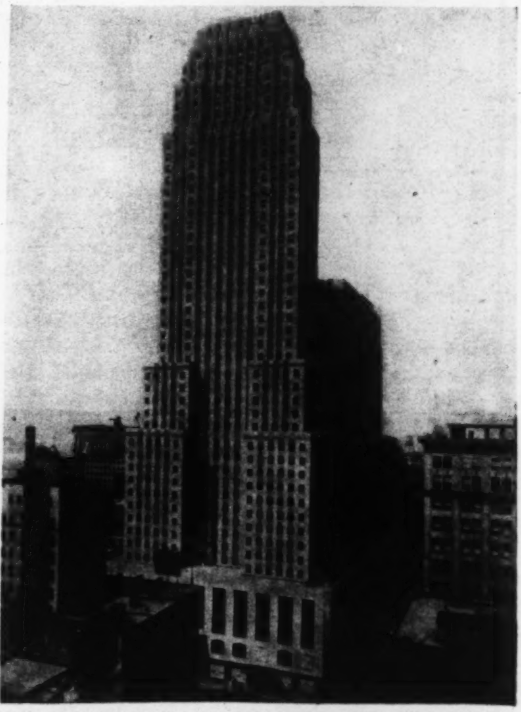


FIG. 1—CAREW TOWER BUILDING IN CINCINNATI
This steel-frame structure with stone concrete floors includes a 48-story office building, a 30-story hotel and a 29-story garage.

The percentage given under "probable variation" in the following tables is a measure of the uniformity of the strength obtained. The figure given is that known to mathematicians as the "probable error of a single observation" and is derived by applying the theory of least squares to the test results. The significance of a probable deviation of 5 per cent, for example, may be stated as follows: If a large number of additional cylinders had been made from the concrete from which the given series of samples were taken, half of these additional cylinders would be expected to break within 5 per cent of the average strength of the cylinders actually tested. Some such measure of uniformity, although frequently omitted, is of almost as much significance as the average strength itself.

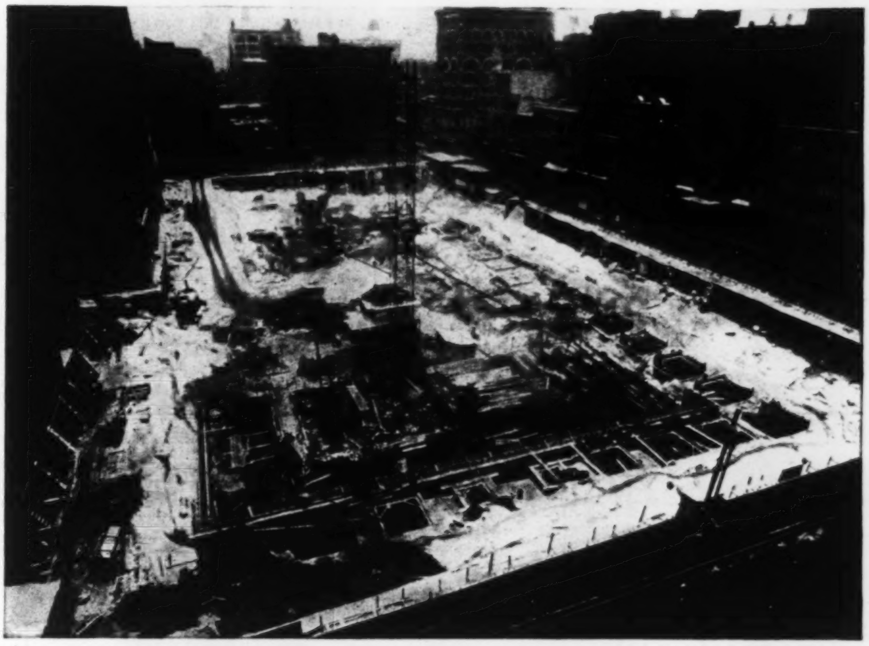


FIG. 2—FOUNDATION CONSTRUCTION, CAREW TOWER, CINCINNATI
Much of the foundation concrete was poured during the winter months.

A total of 323 test cylinders was made. Of these, four are omitted because they were noted by the laboratory as defective cylinders, either through freezing on the job or because of the presence of extraneous material in the concrete. Eleven cylinders were broken at various ages, the number at any age being too small to be worth reporting here. The remaining 308 cylinders are reported in Tables I, II and III.

The uniformity of the design is shown by the low probable variations of the laboratory-cured specimens. The higher variations for job-cured cylinders indicate the effect of temperature, pouring taking place from January to August, with a range in temperature of over 70 deg. F.

For certain locations 36-hour wrecking of forms was required. For this use a mix was designed with 6.2 sacks of cement per cubic yard and a water-cement ratio of 0.79. Two cylinders broken at 36 hours gave strengths of 1,331 and 1,593 lb. per square inch, respectively.

Two cylinders of mix A were made when the foundations were being poured and were then buried adjacent to a footing. They were later dug up and broken, giving the following strengths: at the age of 70 days, 4,655 lb. per square inch; at 210 days, 6,314 lb. per square inch.

*Workability*—The maintenance of proper workability of concrete is as important to the contractor as the control of strength is to the engineer. While dry mixes develop high strength in the test specimens, they are not satisfactory on the job; the difficulty of placing adds materially to the cost of the work, and the stiffness of the concrete prevents the proper filling of the forms and embedment of the reinforcing steel. On this job the concrete was designed to give a slump of from 5 to 7 in. One of the control men was stationed at the point where the concrete was being deposited. An electric-light signal system allowed him to give such instructions to the mixer man as were necessary to maintain the proper consistency.

With a mixing time of one minute the workability of the concrete was such as to permit rapid placing in the forms with a minimum of labor. In a crew placing concrete at the rate of 1 yd. per minute, two men were employed in jigging the reinforcement in the ribs by means of hickies to insure the proper embedment of the bars. No other tamping, spading or rodding, and no vibration of formwork was used on the job. This unusual economy in placing labor does not indicate that any necessary work was neglected, as was shown by the minimum amount of pointing up that was required. Due to the high workability of the mix and the consequent freedom from honeycomb, pointing up was done by one cement finisher and one helper, on a job where 800-yd. daily runs were a commonplace.

TABLE I—CONCRETE IN FOUNDATIONS

| Mix | Age at Test, Days | Method of Curing | Number of Specimens | Average Strength, Lb. Per Sq.In. | Probable Variation, Per Cent |
|---|---|---|---|---|---|
| A | 7 | Laboratory | 14 | 2,010 | 8 |
| A | 28 | Laboratory | 15 | 3,470 | 9 |

TABLE II—CONCRETE IN BASEMENT AND FIRST FLOORS

| Mix | Age at Test, Days | Method of Curing | Number of Specimens | Average Strength, Lb. Per Sq.In. | Probable Variation, Per Cent |
|---|---|---|---|---|---|
| A | 3 | Job | 2 | 1,510 | 27 |
| A | 4 | Job | 4 | 1,650 | 10 |
| A | 5 | Job | 3 | 1,640 | 23 |
| A | 6 | Job | 3 | 1,620 | 27 |
| A | 7 | Job | 7 | 1,580 | 18 |
| A | 28 | Laboratory | 5 | 3,812 | 5 |

TABLE III—CONCRETE IN SUPERSTRUCTURE

| Mix | Age at Test, Days | Method of Curing | Number of Specimens | Average Strength, Lb. Per Sq.In. | Probable Variation, Per Cent |
|---|---|---|---|---|---|
| A | 3 | Job | 19 | 1,096 | 14 |
| A | 4 | Job | 65 | 1,523 | 9 |
| A | 28 | Laboratory | 14 | 3,593 | 5 |
| B | 3 | Job | 45 | 1,440 | 11 |
| B | 4 | Job | 5 | 1,681 | 13 |
| B | 28 | Laboratory | 34 | 3,592 | 7 |
| C | 3 | Job | 27 | 1,690 | 12 |
| C | 4 | Job | 7 | 2,037 | 10 |
| C | 28 | Laboratory | 35 | 3,997 | 7 |

*Savings*—It is difficult to evaluate the savings in cement, time and formwork which were made possible by the design and control of the concrete on this job. Some idea of the cement savings may be obtained by a comparison of the actual mix with the usual arbitrary 1 : 2 : 4 proportions. With Cincinnati materials the 1 : 2 : 4 mix requires approximately 5.7 sacks of cement to the yard; according to the Cincinnati building code and general practice, it would be assumed to develop a standard 28-day strength of 2,000 lb. per square inch. The striking point of the concrete design used on this job is that materially higher strengths were obtained at actual savings in cement; thus, mixes A and B developed 3,600 lb. per square inch at cement savings of 0.7 and 0.4 sacks per yard, while mix C developed 4,000 lb. per square inch at a saving of 0.2 sacks per yard. Even where 36-hour wrecking of forms was required the necessary strength was obtained. with an excess of only 0.5 sacks per yard over the conventional 1 : 2 : 4 mix, without the use of special cements or admixtures.

In regard to formwork, it should be noted that the Cincinnati building code would have required the sla forms to remain in place twenty days after pouring of the concrete, if the 1:2:4 mix without constant control had been used on the job. The actual three- and four-day wrecking was carried on under the inspection of the building department, whose approval of the practice was based upon the results of the job test cylinders.

The results of this job show that the water-cement ratio law may be applied successfully in the field of building construction, and that an intelligent design and rigorous control can be depended upon to produce uniform high-strength concrete with increased workability and decreased cost of materials and labor.

The design and control of the concrete on the Carew Tower was in charge of Ernest A. Hagy. The general contractor was Starrett Brothers, Inc., Chicago, for whom James E. Smith was superintendent. The architect was W. W. Ahlschlager, with Delano and Aldrich as associate architects. The structural design was prepared by Liebermann and Hein, structural engineers, Chicago, Ill.

# State Highway Officials Discuss Administration and Finance in Pittsburgh

## Association Adopts Revised Code Demanding a Tightening Up in the Use of State Funds and Centralized Control of Expenditures—Emergency Federal Aid for Highway Work Urged

*Engineering News-Record Staff Report*

PROBLEMS of administration and finance dominated the proceedings of the annual convention of the Association of State Highway Officials held last week in Pittsburgh, Pa. The dozen and a quarter technical committees of the association advanced their work in committee sessions, and their reports on specifications and practices came before the general convention only as briefs which were submitted to the executive committee for review and action on their adoption and publication. Major action in general convention was centered on the new code of principles proposed by the committee on administration, on the resolutions concerning federal aid and the diversion of state tax money to local roads, and on the individual papers all relating to broad questions of the financing and management of public roads.

### *Administration and Finance*

In revising the code laid down by the association in 1924, the committee on administration presented a virtually new set of principles. These, as adopted by vote of the convention, were in brief as follows:

All public roads should be classified as: (1) primary roads, comprising the federal-aid and state systems; (2) secondary roads, comprising the principal county trunk or state-aid highways; and (3) third-class roads, comprising purely local or township roads.

State and federal funds for new construction should be devoted first to primary highways and should be expended by or under the supervision of the state highway department. Secondary highways should be financed by local general taxes and state aid. Third-class roads should be financed by local general taxes, but special assessments on adjoining land may be justified to defray a portion of the cost. Improvement districts to raise funds by special assessment may properly be organized where special benefits result from extraordinary highway undertakings in congested districts; this practice should be limited to conditions that are not average or normal and does not apply to rural districts.

In financing state roads general principles may be set down as follows: (1) States in the initial stage of highway development should issue bonds to defer that portion of the annual charge for construction which would overburden either property or the road user; (2) states where the original construction programs are well under way can in the main finance new construction from current funds, utilizing bond issues to defer the costs of special projects; (3) states where original construction is largely completed are concerned chiefly with maintenance and reconstruction and should depend on current funds except in cases of emergency. State bonds should be serial, maturing over 30 years, and bonds for political subdivisions of the state should mature over 20 years and also be serial. Maturities should be scheduled so that annual payments will be as nearly uniform as practicable.

Sound financing requires that the retirement of state bonds, as well as the interest on them, be provided for by motor-vehicle license fees and gasoline taxes, but these payments should be guaranteed by the full taxing power of the state as a provision against failure of these levies and to secure a lower rate of interest.

A fixed charge should be made for each class and weight of motor vehicle, in the form of a license fee in lieu of all personal property taxes or in the form of a combination license fee and personal property tax. The total rate of such a tax, however, as well as the gasoline tax (which is not to be in lieu of a license or property tax) should be as uniform in the several states as practicable, consistent with state constitutions, road-bond obligations or road needs. The state should be the sole agency levying special taxes on the motor vehicle or the highway user.

All motor-vehicle funds including personal property taxes should be used for highway purposes.

The large expenditures for highway purposes and the broad training required in handling them demand: (1) correlation under adequate engineering supervision; (2) stable organizations and policies; (3) the elimination of political patronage. A uniform, adequate and informative system of accounting and reports should be enforced by every highway administrative body.

When the primary system of highways has reached an advanced stage of improvement in keeping with traffic demands, more mileage may be added only when funds are available for the maintenance, construction and reconstruction of the existing system.

Whenever state funds are used in the improvement of secondary highways or on streets in cities over which trunk highway traffic is routed, such funds should be under the direct supervision of the state highway departments.

Toll bridges should be built only when it is impossible to finance them by any other method. If toll bridges are constructed the construction should be financed by the state or political subdivision and the bridge made free as soon as the financial obligations of interest and original investment are met.

### *Financing County and Local Roads*

Advanced thinking on the financing of secondary and third-class roads was exemplified in a paper by Frank T. Sheets, state highway engineer of Illinois, describing the methods followed by his state in financing its 9,800 miles of primary roads, of which 7,631 miles have been surfaced with high-type pavements (largely concrete) since 1918. The total expenditure on this mileage and as state aid for 1,750 miles of county trunk roads, has been $285,774,000, obtained as follows: motor license fees, 27.23 per cent; federal aid, 12.93 per cent; miscellaneous, 1.03 per cent; state bonds, 53.79 per cent; gasoline tax, 5.02 per cent. It should be noted that the gasoline tax has been in force virtually only a year and that motor license fees are carrying and amortizing the bonds. With about 2,200 miles of the primary system to be constructed, the financing will be accomplished from current funds and it is expected that the system will be completed in 1933.

Speaking of federal aid, the paper urged that it should not be diverted to second- or third-class roads but should be used to complete the present 7 per cent system and thereafter to enlarge the state or federal-aid system. Any other procedure was considered unfair to the states, which are paying more into the federal treasury than they are receiving in federal aid.

Administration of county highways should be in the hands of a county highway department financed by funds from county tax levies. Where the state system has reached an advanced stage and state road funds can well be spared, it is good practice to allot from such funds aid for county-road improvement. These allotments should be expended under the general direction of the state highway department and never without such supervision.

Stating that the administration of local or township roads by township supervision, without supervision by any county or state agency, had been generally chaotic and wasteful, the opinion was expressed that local highway affairs should be centralized in not more than one highway official for each township. Also this official should be subject to general supervision by some recognized county authority. Perhaps an even more suitable arrangement would be to abolish entirely township and road district highway officials and centralize all highway work in the county as the financing and administrative unit.

### *Economics of Detours*

Presenting the reasoning and formula for determining the service value of a road, topics which were discussed by him in *Engineering News-Record*, Dec. 5, 1929, p. 884, and Sept. 25, 1930, p. 493, W. A. Van Duzer, assistant chief engineer, Pennsylvania department of highways, gave specific data of interest on detour economics.

The detour, it was stated, is far less objectionable when its length can be reduced to definite economic limits as determined by the economic relation between length of detour and volume of traffic. Again, the detour enjoys more favor when it is maintained according to the same standards as the state highway and when it is made safe and free from confusing or doubtful turns.

Last year the detours in Pennsylvania were 819 miles longer than the highways for which they were substituted. The average daily traffic using this detour mileage was 825 vehicles for a period of 120 days. Using 14c. as the average vehicle-mile cost of operations, including time loss, the public spent about $11,350,000 in additional operating costs, or enough to construct 200 miles of road. Half-width pavement construction is frequently more economical than a detour, but again the time loss to the vehicle on account of half-width construction must be evaluated. It has been found that where traffic is heavy and maintenance is high it is economy to provide half-width, high-early-strength concrete to permit traffic to use the pavement on the day following pouring. Traffic delays are reduced, safety is increased and confusion decreased, and congestion is reduced, giving construction activities more freedom.

### *Accounting, Traffic Surveys and Regional Highways*

In a paper on the benefits of accounting reports to the highway administrator, R. H. Baker, commissioner of highways of Tennessee, described the monthly report system used in that state. This included general balance sheet of assets and liabilities, balances by counties of automobile funds, accounts receivable, inventories, contract liabilities by projects on all state-aid, federal-aid, bridge and other operations, gas-tax balances by counties, bond obligations, and receipts and disbursements. Such a report, it was asserted, was not laborious, was not confusing in detail, kept the department men in field and office alert to expenditures and costs and kept the department head closely and continuously in touch with its finances.

Thomas H. MacDonald, chief of the Bureau of Public Roads, recounted the wide use being made in states having traffic surveys of such data for planning improvements, and he urged the advantage of these surveys to all states. Incidentally, he took a stand against the division of gas-tax money to local roads until primary road systems had been completed and extended. Col. Sidney D. Waldon, president of the rapid-transit system of Detroit, Mich., in a paper on metropolitan highways presented figures of the rapid shift of population from rural to urban districts, as an argument for state aid for city thoroughfares. He described the plan for state aid by Michigan to Detroit in its program of street widening on main thoroughfares connecting with state trunk-line roads. Briefly, the state will contribute $16,000,000 over a five-year period.

### *Emergency Federal Aid Urged*

Expressing sympathy with the request of Arthur Woods, in charge of emergency measures to relieve unemployment, the convention pointed out that its ability to give prompt aid rested on the possibility of realizing on federal-aid money more freely than under present restrictions. So that congress might have a definite presentation for consideration and action, resolutions were adopted: (1) calling for changes in the present law, permitting an allotment of federal aid to an amount equal to half the cost of the highway—the limit is now $15,000 a mile; (2) requesting a substantial emergency federal-aid appropriation to be expended under the existing federal legislation; (3) requesting a substantial emergency fund to be advanced by the federal government to the states, to be used for matching the federal-aid funds and to be later repaid by the states; (4) requesting a substantial emergency federal appropriation for forest-reserve highways; and (5) requesting amendments to the federal-aid law to expedite the use of federal funds for emergency purposes.

## Municipal Sewage in Tidal Waters Held Not to Be a Menace

An interesting decision was recently made by the Maryland court of appeals in the case of Cityco Realty Co. vs. Mayor, Counselor and Aldermen of City of Annapolis, reported in *U. S. Public Health Reports* for Aug. 8, 1930. The city of Annapolis discharged and has done so for many years untreated sewage into adjacent tidal waters. The waters were heavily polluted and the state legislature had taken note of this condition in legislation enacted by it. The trial court dismissed the suit and the company appealed.

The court of appeals stated that, assuming that a public nuisance which injuriously and specially affected private rights could be enjoined, the questions presented were (1) whether the acts complained of constituted a nuisance, and (2) whether, if they did, they should be restrained under the circumstances of the case. It was said that the rule, recognized wherever the question had arisen in the courts of this country or England, was that the discharge by a municipality, acting in the exercise of power conferred by the state, of sewage into tidal waters was not a nuisance. The court said, however, that the rule did not protect a municipality where, through negligence or a wanton disregard of public or private rights, it does in fact create a nuisance or actually invades private property.

Proceeding, the court then stated that "as there is no evidence of any negligence or misconduct in this case, it follows that the acts complained of do not constitute a nuisance if done under the authority of the state."

## Parker Route Recommended for the Colorado River Aqueduct

### Pumping Project With Intake at Parker Found More Economical and Less Hazardous to Construct and Operate Than Three Competing Projects

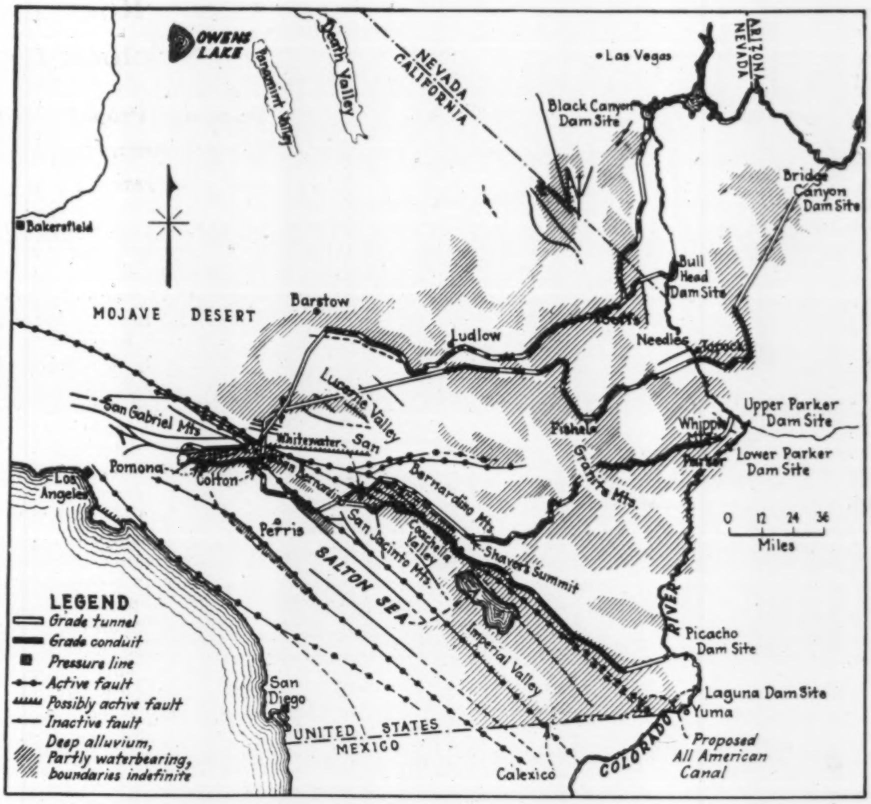
ABOUT TEN YEARS AGO it became evident that the growth of population in Los Angeles and the other cities of the Metropolitan Water District of Southern California would eventually require more water than the existing Owens Valley source could provide. The Colorado River, nearly 300 miles to the east, was tentatively selected as the only adequate source, and preliminary surveys were undertaken to determine works and routes *(Engineering News-Record,* April 2, 1925, p. 560). Then, with numerous routes for an aqueduct determined, it was found necessary to abandon the work until the plans for a dam in Boulder Canyon became definite. *(Engineering News-Record,* May 31, 1928, p. 850.) When the site of the Boulder Canyon dam was finally located in Black Canyon and the dimensions of the project definitely fixed, the water district, in November, 1929, prepared a report setting forth all preliminary data on the aqueduct and submitted it to an engineering board of review consisting of Thaddeus Merriman, A. J. Wiley and Richard R. Lyman. This board selected four routes from 50 or more investigated and recommended that detail surveys, plans and geological studies be made. Study of these routes, which are shown on the accompanying, map, as well as of two additional ones—one from Bridge Canyon and one following the All-American Canal route—was at once taken up by the district organization, with the result that the Parker project was found best. —EDITOR.

SELECTION of the Parker route for the Colorado River aqueduct of the Metropolitan Water District of Southern California was recommended to the directors of the district on Nov. 10 by Frank E. Weymouth, chief engineer. His report was referred by the directors to the board of review which was appointed last year to study various proposals. The initial construction cost, including interest, is set at $206,279,000. The route from Picacho, about 20 miles north of Yuma, Ariz., and the All-American Canal route were estimated to cost less than the Parker route but were ruled out because of earthquake and cloudburst dangers. The remaining routes were estimated to cost from $227,000,000 to $557,000,000, the latter being the cost of the Bridge Canyon gravity line.

The Parker route is 265.5 miles long and is a pumping route with a total pumping lift of 1,523 ft. The recommended plan calls for the construction of a diversion dam a few miles above Parker, Ariz., at a cost of $12,958,400, if permission can be obtained from Arizona, and otherwise direct diversion and clarification. The cost of water delivered to the district on this route, according to the report, will average $26.56 per acre-foot over a 40-year period and $21.88 over a 100-year period. The recommended Parker route would terminate in the proposed Puddingstone reservoir and would not utilize the Pine Canyon reservoir now being built by the city of Pasadena. The power required for the Parker route is estimated at 309,300 kw. without a diversion dam and 291,040 kw. if the dam is built. The other routes investigrated and reported on included Black Canyon, Bolls Head and Picacho, (which with the Parker route comprised the four recommended by the board of review), and in addition the All-American Canal and Bridge Canyon gravity line.

In the matter of estimated costs, the report separated the cost into two phases based on a development plan under which the aqueduct would be built to deliver 640 sec.-ft. at first and 1,500 sec. ft. ultimately. In the initial development all tunnel sections and the main aqueduct would be built to full capacity, leaving pumping plants, pressure lines and terminal storage facilities to be enlarged as the demand for water increased.

The final results of the geological studies and route surveys are shown on the accompanying map. Particular attention was paid to faults, among which the better known are San Andreas, Mission Creek, San Jacinto, Whittier and Inglewood. All of the important faults lie within or southwest of the general line of the San Gabriel and San Bernardino mountains and along the northwest side of the Coachella and Imperial valleys. Between this line and the Colorado lies the desert region, also hazardous territory for an aqueduct. The survey showed that all routes must cross the San Andreas fault, and in the opinion of F. L. Ransome, consulting geologist to the district, the crossing of this fault "or any of its probable active branches in a deep tunnel would involve greater hazard than is justifiable." Also in regard to the desert basins in which the unconsolidated alluvial material extends to a depth of at least 1,000 ft., Mr. Ransome stated that the geological conditions are unknown and attempts to tunnel under these basins might meet with serious difficulty.


OWENS LAKE
Panamint Valley
Death Valley
NEVADA
CALIFORNIA
Las Vegas
ARIZONA
NEVADA
Black Canyon Dam Site
Bridge Canyon Dam Site
Bakersfield
MOJAVE DESERT
Barstow
Bull Head Dam Site
Ludlow
Needles
Topock
Lucerne Valley
San Gabriel Mts.
Whitewater
San Bernardino Mts.
Pomona
Colton
Los Angeles
Fishels
Granite Mts.
Whipple Mts.
Upper Parker Dam Site
Parker
Lower Parker Dam Site
0 12 24 36
Miles
Perris
San Jacinto Mts.
Coachella Valley
Shavers Summit
SALTON SEA
RIVER
Picacho Dam Site
Imperial Valley
Laguna Dam Site
Yuma
San Diego
UNITED STATES
MEXICO
Calexico
COLORADO
Proposed All American Canal
LEGEND
Grade tunnel
Grade conduit
Pressure line
Active fault
Possibly active fault
Inactive fault
Deep alluvium, Partly waterbearing, boundaries indefinite

COLORADO AQUEDUCT ROUTES AND GEOLOGICAL CONDITIONS

Line originating above Parker, Ariz., has been singled out by Southern California water district engineers as most feasible among the four recommended routes—Black Canyon, Bulls Head, Parker and Picacho—of the special board of review. Consideration was also given to a route from Bridge Canyon above Black Canyon and a route following the line of the proposed All-American Canal.

### Parker Route Conditions

In recommending the Parker route the report points out that the tunnels are shorter, lie at less depth and traverse more stable ground than on any other route, and that the work as a whole involves less risk. The report also calls attention to the fact that a dam in the Colorado River at Parker, as contemplated, would require the consent of Arizona, but foresees the possibility of making it a joint enterprise to serve the Parker-Gila project in Arizona. Foundation conditions are ideal for a dam of any type, except for a great depth of overburden in the river channel. The contemplated dam would raise the water level 72 ft. to El.458. An alternative to the dam would be the construction of clarification works at the point of diversion, involving a low-head pumping plant to lift the water from the river. With the dam, sufficient reservoir capacity would be provided to care for clarification, and water could be diverted at a considerably higher elevation. It is pointed out that while the first cost of the project is somewhat greater with the dam, the clarification works are also expensive not only to construct but to operate.

The board recommended that the aqueduct should be routed via Rice, Shavers Summit and Whitewater to Potrero, as shown on the accompanying map. West of Potrero the line should be routed either via Perris reservoir, Colton and Ontario to a point in the vicinity of Puddingstone reservoir, or via the Cajalco reservoir, Corona and Brea Canyon, depending on the final choice of reservoir groups. Near the eastern end the Hayfield reservoir could be utilized as a protection against possible interruptions in flow of the open canal.

With a dam at Parker, the initial pump lift to El.989

TABLE I—ESTIMATED QUANTITIES FOR SEVERAL COLORADO AQUEDUCT ROUTES

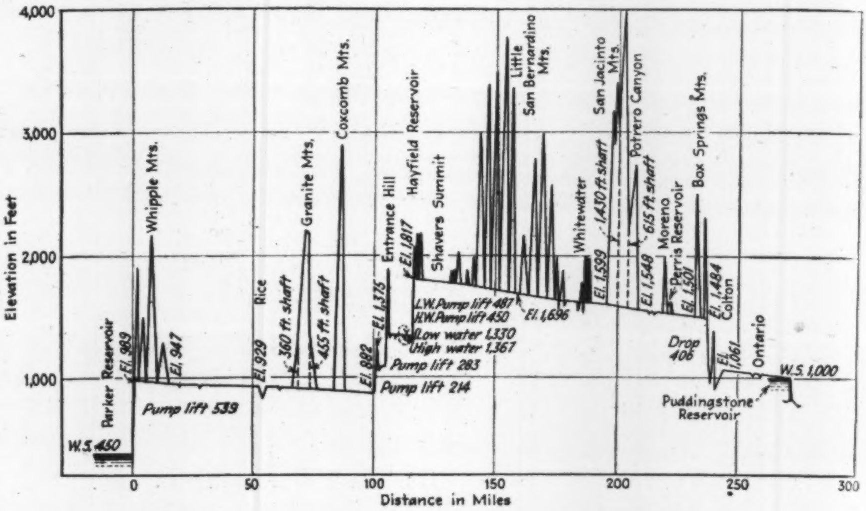
| Route | Tunnels | | Canals and Conduits | |
|---|---|---|---|---|
| | Excavation, Cu.Yd. | Concrete, Cu.Yd. | Excavation, Cu.Yd. | Concrete, Cu.Yd. |
| Parker | 5,506,487 | 1,312,633 | 30,586,239 | 2,894,789 |
| Picacho | 3,179,312 | 769,151 | 35,736,264 | 4,416,446 |
| Black Canyon | 6,570,740 | 1,603,355 | 29,925,502 | 3,803,439 |
| Bulls Head | 5,320,081 | 1,285,879 | 25,911,598 | 3,292,516 |
| Bridge Canyon | 14,746,513 | 3,447,406 | 17,152,773 | 2,381,561 |

TABLE II—PHYSICAL DATA—PARKER ROUTE OF COLORADO RIVER AQUEDUCT

| | |
|---|---|
| Number of pumping plants | 4 |
| Total pump lift, ft | 1,523 |
| Electric power for pumping kw | 291,040 |
| Power at point of diversion, kw | 29,100 |
| Returned power produced, kw. | 38,430 |
| Total power produced, kw | 67,530 |
| Open canal, lined or unlined, miles | 74.12 |
| Closed-surface conduit, miles | 80.26 |
| Pressure tunnel, miles | 2.20 |
| Grade tunnel with shaft, miles | 22.65 |
| Grade tunnel without shaft, miles | 68.82 |
| Steel delivery line, miles | 0.99 |
| Steel penstock, miles | 0.60 |
| Steel siphon, miles | 1.00 |
| Concrete pipe lines, miles | 16.27 |
| Longest tunnel, miles | 12.95 |
| Second longest tunnel, miles | 9.70 |
| Greatest dist. bet. shafts, miles | 5.02 |
| Number of shafts | 4 |
| Deepest shaft, ft | 1,430 |
| Second deepest shaft, ft | 615 |

is 539 ft. to a 12.3-mile tunnel through the unfaulted granitic formations of the Whipple Mountains. Beyond the tunnel is a 51-mile length of surface conduit, free from disturbance by cloudbursts or earth movements, leading to a tunnel through the Granite Mountains. The open-conduit section from the Granite Mountains to Shavers Summit will include the pumping plants required to lift the water to the final elevation of 1,817 ft. West of Shavers Summit the line is in granite rock tunnel along the face of the San Bernardino Mountains, a location believed to be free from dangerous faulting. The line crosses the upper end of Coachella Valley and the San Andreas fault on the surface "under conditions which insure reasonable safety against disastrous damage in case of movement." The San Jacinto fault line is also crossed at the surface. Numerous routes are available from this point to the terminus in Puddingstone or Brea reservoirs, and it is pointed out that a power drop of 406 ft. is available at Colton if the line is routed that way.

In summarizing reasons for the choice of the Parker route the report states that this route will furnish water to the district at less cost per acre-foot, all costs considered, than any other safe and satisfactory route; that it involves less hazardous construction than any other route and will be the safest line to operate; that it fits terminal storage facilities better than the Black Canyon route, its only serious competitor; and that it may be extended to Bridge Canyon at some future time, if warranted, thus partially eliminating the need for pumping.



PROFILE OF PARKER ROUTE OF COLORADO RIVER AQUEDUCT

### *Disadvantages of Other Routes*

*Black Canyon*—The route from Black Canyon is longer than the Parker route, requires more expensive tunneling due to faulting and alluvial deposits, must use a minimum of surface conduit because of lack of storage facilities for equalization and protection against canal breaks, and would logically be terminated at the Pine Canyon reservoir, where the storage is inadequate. A feature of this line is the proposal to use only two pumping lifts, one of 1,029 ft., the other of 633 ft.

*Bulls Head*—This route is identical with the Black Canyon route except for a short distance at its eastern end. The necessary dam, about 50 miles below Black Canyon, would be limited in height by the tail-water level at Black Canyon Dam. Six separate pumping lifts are required, five of them near the dam site. The first cost is slightly less than the Black Canyon route but the ultimate cost of water slightly greater.

*Picacho*—Diversion would be made about 20 miles north of Yuma, Ariz., with direct pumping and de-silting. Alluvial formations would complicate tunnel driving. Geographical conditions about 75 miles west of the diversion point make an intermediate power drop of 213 ft. necessary. The route is near the San Andreas fault for much of its length and would be in serious danger from earthquakes, especially since much of its open-conduit line would lie in soft materials. Increased operating expense for this line over the Parker route seems certain.

*All-American Canal Route*—The western end of this route is identical with the Picacho route along its most dangerous section. It is not known definitely when the All-American Canal will be constructed. A co-operative project, such as this necessarily would be, would probably involve operating difficulties. The route of the canal passes through the cloudburst and earthquake regions of the Imperial Valley. Necessary sanitary regulations would be difficult to enforce. The aqueduct route would follow the San Andreas fault even more closely than the Picacho route. The canal would have to be lined. Filtration and treatment costs might be unusually high.

*Bridge Canyon*—This route would be an all-gravity line, diverting from the river 120 miles upstream from Black Canyon, requiring a 600-ft. dam at the lower Bridge Canyon site and other regulating dams at Dewey and Flaming Gorge. To make the project feasible, all power would have to be owned and controlled by the district, and this would probably not be permitted. Tunnel construction would be expensive because of depth, faulting, and water-bearing alluvium through which many shafts would have to be sunk. A steel pressure-line crossing of the Colorado River would have to operate under a 1,025-ft. head. Some of the tunnel locations at the west end would be in water-bearing gravels. Although this project would probably increase the amount of hydro-electric power available, the lack of a market makes this a questionable advantage. Savings in eliminating pumping costs would be partly offset by the necessity of paying taxes on property outside of California. Initial cost would be over twice as much as the Parker route.

### *Terminal Storage*

The cheapest and most convenient storage was described as involving the use of the Los Nogales reservoir in the valley west of Pomona, but the territory is highly developed and probably not available. The more remote locations—Cajalco and Perris—are both satisfactory, the advantages of one over the other not great. Final choice, according to the report, may hinge on right-of-way negotiations.

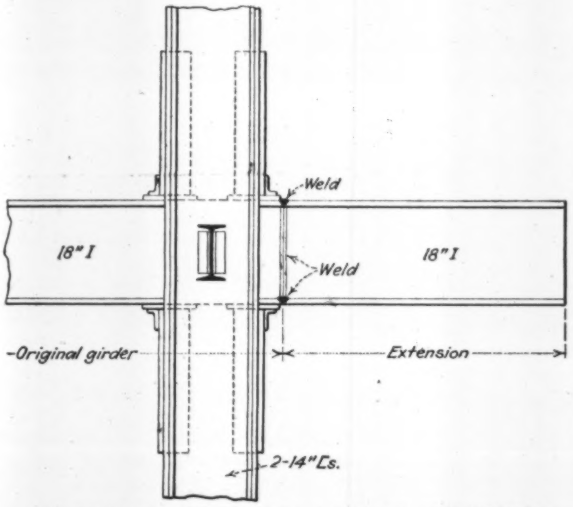
# From Job and Office

*Hints That Cut Cost and Time for the Contractor and Engineer*

## Cantilever Girder Attached by Butt Weld

A HEAVY-DUTY butt weld was resorted to in constructing the steel frame of a new building of the Deutsche Museum at Munich, Germany. After the frame as originally designed had been completely erected, a change was made in the plans which required cantilevering certain main girders beyond the columns to which they framed. As the nature of the framing made a riveted splice awkward, a butt weld was used.

The columns at these points consist of two 14-in. channels, spread to pass the 18-in. I-beam girders between them. The original girders are connected by top and bottom angle brackets to both flanges of the columns, in order to obtain a firm joint for rigid-frame action. The difficulty of making an ordinary splice for extending the girders under these conditions is evident from the sketch, reproduced from *Der Bauingenieur* of Aug. 29, 1930, where the circumstances of this welding work are described by R. Gerhart and H. Treimer. The intended loading on the cantilever extension was such as to result in a maximum load moment at the point of connection of 12,000 lb. per square inch. It was believed that an arc-welded butt joint would be satisfactory under these conditions. A number of girders were successfully welded in this way, and one of them was submitted to test loading, which gave a satisfactory demonstration of the excellence of the connection.



BUTT-WELDED CANTILEVER GIRDER EXTENSION
Part of a new building of the Deutsche Museum at Munich, Germany

The girder ends were prepared for welding by beveling the top faces of upper and lower flanges to a 40-deg. angle (80 deg. included angle), and similarly beveling both sides of the web. The cantilever extension was supported on scaffolding, the joint butt-welded and then the welding completed. Coated electrodes were used, with alternating current of 110 amp. The web connection was made by a single-layer weld on each side, but the flanges required up to four layers, each layer being cleaned by hammering and brushing.

A load test on one side of the completed cantilever extension was made by applying the load through a lever and leaving it in place for 24 hours. The stress at the weld joint was 26,000 lb. per square inch. No distortion or other evidence of distress could be noted.

## Formulas Provide Ready Check on Computation of Triangles

By Herbert N. Bradstreet
*Duarte, Calif.*

SURVEY computations which are based upon the solution of a series of triangles can easily be checked by means of the equalities expressed in a pair of neglected formulas bearing the name of Mollweide's equations. Using the standard notation, with $A$, $B$ and $C$ as the angles opposite the sides $a$, $b$ and $c$, these are expressed as follows:

$$\frac{a-b}{c}=\frac{\sin\frac{1}{2}(A-B)}{\cos\frac{1}{2}C} \qquad (1)$$

$$\frac{a+b}{c}=\frac{\cos\frac{1}{2}(A-B)}{\sin\frac{1}{2}C} \qquad (2)$$

Suppose that the three angles of a triangle have been measured and adjusted, and two of the sides have been computed from a given or measured third side. If, in the computations, there has been an error as great as one in the fifth place in any side, or a single second in any angle, the two quotients in either of the formulas stated will not be equal. If seven-place logarithms are used in the reductions, it has been found that the lack of agreement will be greater than 9 in the seventh decimal. When a calculating machine is used, the two quotients should not disagree by more than three or four units in the seventh decimal place, when the sides of the triangle are between 100 and 1,000 ft. long, computed to hundredths; frequently the agreement will be exact.

Of course it is unnecessary to use more than one of the two equations given. The writer prefers the first, as the result is always a decimal, while with the second the result is an integer and a decimal.

The order in which the angles are chosen is important. For all ordinary work, combine the largest and smallest angles in the numerator. If, however, one is looking for errors of a fraction of a second, combine in the numerator the two angles which are nearest alike in size. This brings one to the sine of a small angle, in formula (1), which varies rapidly.

In a right-angled triangle, subtracting the smallest from the largest angle has a decided advantage—the result is the third angle, and it becomes possible then to compare the tangent of one-half this angle with the quotient of the longest side minus the shortest, divided by the third side. So far as the writer has been able to ascertain, this relation has never been pointed out before.

## Gaging Car Over Columbia River Runs on 1,237-Ft. Cable Span

An UNUSUAL stream-gaging cable installation has recently been completed by the water resources branch, U. S. Geological Survey, across the Columbia River at The Dalles, Ore. With a clear span of 1,237 ft. and a clearance of 75 ft. above low water, this is one of the largest jobs of its kind ever erected. The cable is supported by a 54-ft. steel tower on each bank. Each tower carries an airway red electric code beacon weighing 125 lb. with two 200-watt lamps. Over the main cable four 100-watt lights are suspended on a pilot wire. An astronomical dial time switch adjusted to latitude and longitude will turn the lights on at sunset and off at sunrise. The lights will flash 30 times per minute by use of a motor-driven flasher making and breaking contact through a column of mercury.

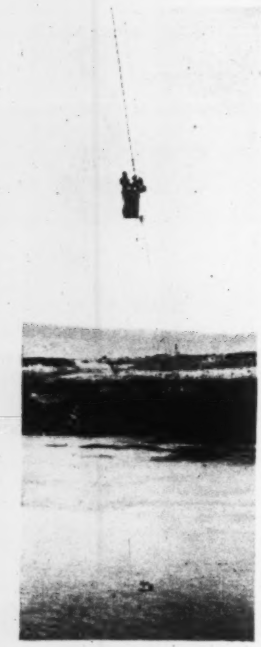


FIG. 1—GAGING STATION AT THE DALLES, ORE.

In order to keep the lights and bare electric wire from sagging down to the main cable under ice and wind load it was necessary to suspend these from a special wire with an elasticity modulus of at least 22,000,000 and a breaking strength of not less than 45,000 lb. A ⅝-in. seven-wire strand was used. The main cable is a 1-in. galvanized track strand. Connections are made through turnbuckles to steel U-bolts embedded in concrete deadmen on the banks. (See Fig. 2.) Socket connections were used on the wires, no clips being employed except for wind guy wires. The triangulation, complex computations and cable measurements through which the connections were installed checked so that the cable fitted into place on suspension.

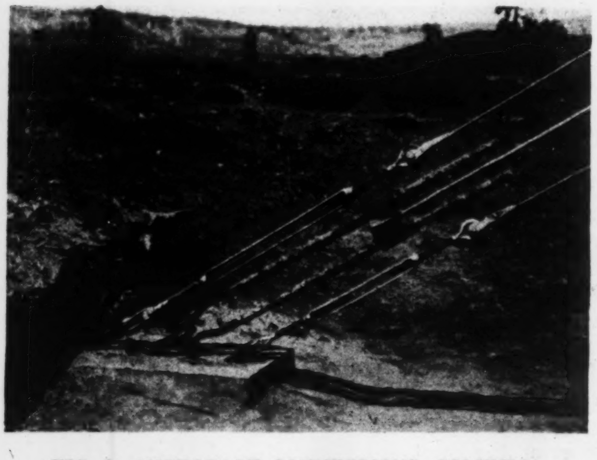


FIG. 2—ANCHORAGE CONNECTIONS, COLUMBIA RIVER GAGING STATION

Messenger cable, main cable and back guy from tower shown in order named.

Discharge measurements are made from a two-man steel gaging car of the latest Survey design which will be moved by hand into positions 30 ft. apart for observations of depth and velocity. An improved Price meter with 100-lb. weight is suspended by a $\frac{5}{64}$-in. airplane strand wire, return circuit for the electrical earphones coming through the water. The meter is operated by use of an Au-Lee hand reel with a dial recording the position of the meter and the depth in feet and tenths. Measurements from the cable will increase the accuracy of results at this station. At present the low-water section of the rating curve is based on boat measurements and the high-water section on observations by floats or from bridges some distance away.

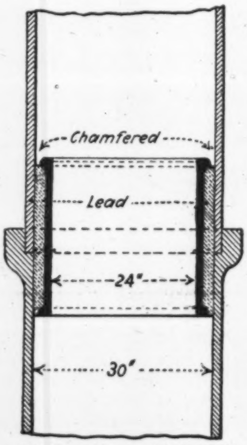
The installation was made under a cooperative allotment of $7,000 from the Corps of Engineers by G. H. Canfield, district engineer in charge of the Portland office, U. S. Geological Survey. B. S. Barnes, assistant engineer, was in charge of field erection.

## Joint in Cast-Iron Siphon Sealed From Within

By Frank P. Morse

*City Engineer, Salem, Mass.*

JOINT leakage in an inverted pipe siphon carrying part of Salem's water supply has been eliminated by the use of two standard sleeves placed within the pipe, rather than on the outside. The 30-in. cast-iron pipe in question passes beneath a tidal stream approximately 40 ft. wide, with the bottom of the siphon 25 ft. below mean high water. The two joints which gave trouble are located in the vertical limbs below water level. After several temporary repairs by calking from the outside, it was decided to attempt a more permanent solution by working from the interior. Flow was shut off, the pipes disconnected at each side of the siphon and the water pumped out after the leaking joints had been temporarily calked by a diver. This made it possible to lower into each limb a 24-in. standard sleeve which had been turned down in a lathe in order to make a fairly close fit with the interior of the pipe. As is shown in the illustration, each sleeve was centered opposite a joint and held in position by four setscrews (not shown) which projected from the sleeve into the joint crevice. The spaces between the bottom of the sleeves and the pipe were then calked, and hot lead poured into the annular openings between the sleeves and the pipe until these were completely filled. To minimize spilling of the lead, which was poured from a small pail fastened to the end of a pole, the upper edges of the sleeves had been chamfered. This completed the repair, and the main was then reconnected to the siphon. Although this job was completed over three years ago, neither joint has shown any sign of leakage since that time.



INTERIOR SLEEVE USED TO SEAL LEAKING JOINT

# Letters to the Editor

### A Forum for Discussion of Views of Engineers and Contractors

## Surface Elevations on Curved Streams

Sir—In your issue of Nov. 6, 1930, p. 739, W. D. Mitchell and L. Harrold ask if anyone will venture an explanation as to why the surface elevation of water in a stream passing around a curve is higher toward the outside of the curve.

It seems to me that centrifugal force is a complete explanation of the action. When a body is compelled to travel in a curve by any means, there is centrifugal force set up. The stream of water, compelled to take a curved path by the shape of the streambed, is thrown by centrifugal force toward the outside of the curve. This outward force would naturally withdraw water from the inside of the curve and force it toward the outside. The tendency of the stream to go in a straight line, which is another way of expressing centrifugal force, deflects the center of flow toward the outside of the curve, and of course this action will raise the surface level in that part of the stream, as the water is subject to greater pressure in that region.

Pittsburgh, Pa., Nov. 13, 1930. Edward Godfrey.

## The London Building Act of 1930

Sir—The building code, or "London Building Act, 1930," went into effect Oct. 1. The provisions of previous codes are brought together in 182 pages. The changes made are surprisingly few. The new code is more of a new edition than a revision.

The act is divided into seventeen "parts," followed by six "schedules." The "parts" have the same titles as those in the London Building Act, 1894. Some of these titles, such as "formation and widening of streets" and "naming and numbering of streets," may seem to an engineer to belong elsewhere than in a building code. A significant provision is that barring out the skyscraper. It reads: "A building (not being a church or chapel) shall not be erected of or be subsequently increased to a greater height than 80 ft. (exclusive of two stories in the roof and of ornamental towers, turrets or other architectural features or decorations) without the consent of the council."

The first and second of the six "schedules" are given to fire resistance of materials and thickness of walls; the fourth and fifth to the fees payable to different officials for services rendered and the sixth to a list of enactments repealed. The third schedule is of especial interest to the structural engineer because it specifies loads and stresses to be used in the design of metal structures. External walls carried by metal framework may be of any thickness not less than $8\frac{1}{2}$ in. for the topmost 20 ft. of its height and 13 in. for the remainder of its height below such topmost 20 ft. The minimum live loads specified for floors and roofs in pounds per square foot are: for dwellings, 70; offices, 100; workshops, 112; retail shops, 112; warehouses, 224; roofs (including wind) inclining upward at an angle greater than 20 deg. with the horizontal, 28 on surface of roof; all other roofs, 56 on horizontal projection. A reduction of 5 per cent is allowed on columns for the story next below the topmost story and a further reduction of 10 per cent for the next succeeding story and 5 per cent for each succeeding story.

The paragraph relating to wind pressure reads: "All buildings shall be so designed as to resist safely a wind pressure in any horizontal direction of not less than 30 lb. per square foot of the upper two-thirds of the surface of such buildings exposed to wind pressure." The writer has always looked with favor on this requirement. The distribution is more severe than 20 lb. over entire surface but is probably more in accordance with the actual condition.

Allowable working stresses are given in tons per square inch, a ton equaling 2,240 lb. For mild steel pillars the working stress per square inch of section (gross section is intended) for $l/r$ from 20 to 120, hinged ends, ranges from 4.0 to 1.0; for $l/r$ from 20 to 160, one end hinged and one end fixed, 5.0 to 1.0, and for $l/r$ from 20 to 200, both ends fixed, 6.0 to 0.5. The tabular loads agree with the formula $4.5 - 0.25\ l/r$ for hinged ends from 20 to 100 $l/r$; for 120 $l/r$ the permissible stress is 1.0, and for 140 $l/r$ it is zero. For one end hinged and one end fixed the tabular loads agree with the formula $5.5 - 0.25\ l/r$ from 20 to 140; for 160 $l/r$ the permissible stress is 1.0, and for 180 it is zero. For both ends fixed the tabular loads agree with the formula $6.5 - 0.25\ l/r$ from 20 to 160; for 180 $l/r$ the permissible stress is 1.5, for 200 it is 0.5 and for 210 it is zero. Values for wrought-iron pillars may be taken at two-thirds the values for mild steel. An excess of 25 per cent is allowed in working stresses where such excess is due to stresses induced by wind pressure.

The allowable working stresses in tension, compression, shearing and bearing are: for cast iron, 1.5, 8.0, 1.5 and 10.0 respectively; wrought iron, 5.0, 5.0, 4.0 and 7.0 respectively; mild steel, 7.5, 7.5, 5.5 and 11.0 respectively. Rivets in double shear must not exceed $1\frac{3}{4}$ times their value in single shear.

A pressure of 12 tons per square foot is allowed on concrete foundations and 5 tons on ordinary brick in concrete mortar.

The loads and working stresses are the same as in the 1909 act. The live load of 70 lb. per square foot to be used for the floors of dwellings and the 100 lb. for the floors of offices are excessive. The New York code of 1930 specifies 40 lb. and 50 lb. respectively, and in office floors if a load of 2,000 lb. placed upon any space $2\frac{1}{2}$ ft. square produces greater stresses than the 50 lb. per square foot uniform load it shall be used. This makes provision for concentrated loads such as safes. The working stresses in the London act for steel columns are ultra conservative. For columns of 60 $l/r$ in the lower story of a building, 8,960 lb. per square inch is allowed; for 80 $l/r$, 7,840 lb. per square inch. In the New York Code the allowable stresses for 60 $l/r$ and 80 $l/r$ are 15,000 and 13,270 respectively.

New York, N. Y., Nov. 10, 1930. Robins Fleming, American Bridge Co.

## European River Training Experience Should Aid in Mississippi Work

Sir—It is a pleasure to read such suggestions as those of Gardiner S. Williams regarding the regulation of the Mississippi River, which are briefed in your issue of Oct. 30. Whether or not, as your editorial in the same issue suggests, the plan proposed was seriously intended as a working plan or merely as a point of departure, it would seem that a very real idea is contained in the suggestion.

Certainly little has been accomplished to date which can be felt to be of a permanent nature in the face of what remains yet to do. Serious consideration, therefor, of other and radically different plans cannot be out of place. A judicious study of such departures from the present practice would be greatly facilitated if this country had possessed hydraulic laboratory results on a large scale, which would indicate at least what such departures would entail and what they would provide. However, the literature in this country of full-scale hydraulics consists of a few fragmentary translations of European works of which there is a large and growing number of the greatest value.

It seems that one mistaken notion which crops up in every field of American practice has long held sway in river operations. The notion that nothing can be learned from European practice is, to say the least, bigoted, and experience in other fields has shown that it is usually greatly in error.

While there are great dissimilarities between the Mississippi and the Rhine, the latter is an indication at least of what can be done with a turbulent and powerful river. It is made to pass floods which comparably would result in great damage on the Mississippi in a channel which is for long reaches wholly artificial and carries a tremendous commerce at all stages, even against a very strong current. While it does overflow this channel the occurrences are relatively very rare. More important perhaps than the works by which it is regulated is the result of many years of experience which it seems hardly wise or fair to disregard entirely, especially as the Rhine is only one out of several rivers in Europe which are controlled with very fair success without resort to canalization.

Grand Junction, Colo., F. C. Merriell.
Nov. 10, 1930.

## *Gas Tax of Ten Cents Proposed for Road Work to Relieve Unemployment*

Sir—During the recent political campaign we heard a great deal regarding the causes of the business depression and consequent unemployment situation which has affected all parts of the country generally. Many economists have reasoned that wages are too high to attract capital.

I have been an employer of skilled labor for many years, sometimes employing as many as a thousand mechanics. I now feel confident that to force wages down by reason of a falling off in demand would be a blunder. Low wages never meant prosperity. If American inventive skill reduces the cost of production by the use of labor-saving machinery, the labor supplanted should share in the economy, not only in the lower purchasing power, but in the adequate wage return to enable labor to purchase what is desirable.

If wages should start to decline, the natural tendency would be for buyers to wait until wages were reduced to a plane providing a bare living. There must be provided a system wherein those willing and capable of working can receive sufficient returns to live well, purchase homes and the so-called luxuries of today, that will be classed as necessities tomorrow.

As for unemployment, except for purposes of political propaganda, it should have no place in our present-day lexicon. We have all about us evidences of what is needed to take up the slack in our industrial force. The means are here, but the organizations to plan and execute are either deficient or defective.

There is a wonderful opportunity for the country at large to make a substantial investment in new roads, which, according to the records of the Westchester park commission, benefits the state without any real burden being added to the taxpayer.

A number of years ago, I advocated a scheme for taxing gasoline to pay for good roads promptly. The motor-car manufacturers and automobile clubs were then generally opposed to the tax. Now I am quite sure they favor it. Why? The tax as finally applied has caused no inconvenience whatsoever, and on account of the reductions in the retail prices of gasoline the tax has not been borne by the motorists directly. I recommend a 10c. tax and this is what it will accomplish: (1) more roads in country districts to help the farmer; (2) more roads and wider roads to accommodate buses and trucks, making safer travel for pleasure cars, and more express highways not passing through large cities and towns; (3) better roads will mean more mileage for pleasure cars and at a less cost per mile. I refer to the statement by Prof. S. S. Steinberg of the University of Maryland, a member of the Highway Research Board: "Consumption of gas required to travel on dirt roads costs the motorists as much as if he had to pay an additional tax of 24c. a gallon on gas. Even good gravel roads impose an additional expenditure of 9c. tax over a concrete road." In addition to the cost of fuel there is the added cost of tires and wear and tear on machinery; (4) the investment will increase property values in suburban districts and on farms far in excess of the cost of improvements and will decrease the cost to the farmer of bringing his product to the markets; (5) the money provided will help to solve the unemployment problem to a very substantial degree.

According to recent reports the consumption of gasoline equals the stupendous yearly total of ten billion gallons. A 10c. gasoline tax will produce a revenue of a billion dollars annually. Directly or indirectly this would provide steady employment for one million men continuously.

If you will drive out into the country on any summer evening, Sunday or holiday, you will observe that the roads are so congested there is little pleasure using the present road system. The extra cost of fuel due to slow-moving traffic can be conservatively estimated at 10c. per gallon of fuel. New express highways would mean more cars in use, greater comfort, and fewer accidents—also increased automobile production. What motorist would not gladly spend ½c. per mile to drive in comfort over modern concrete highways? What motorist would not gladly pay ½c. per mile to have the improved highways cleared of snow in the winter and made safe by sanding on grades or turns?

By the immediate and proper use of a 10c. gas tax applied to new concrete highways and grade-crossing eliminations, the appalling death rate due to automobile traffic would be reduced to a minimum.

I note from an editorial in the Nov. 6 issue of *Engineering News-Record* a statement that bids for road-construction contracts are ten to fifteen per cent below bids of recent years, in spite of the fact that wage rates have been well sustained. I have written to E. M. Flemming, manager of the highways and municipal bureau of the Portland Cement Association, outlining the necessity for action among all engineers to promote road building in order to stimulate business conditions, and I have just received a reply that he is whole-heartedly in favor of the gasoline tax to provide for new and better road construction and maintenance. He calls attention to the temptation of legislative bodies in the various states to use the gasoline tax and the license taxes for various purposes far removed from road improvement, for which the gasoline tax and license tax was originally intended.

I was also pleased to note that your editorial was along the same lines. Would it not be wise to recommend the issuance of bonds to be retired from sinking funds produced by gasoline taxes? In this way it would seem to me to be the most prompt method of obtaining funds to take care of unemployment to stimulate industry in all allied lines supplying materials for the roads and for grade-crossing elimination, and also that being road bonds, the funds collected could not be diverted to other uses.

Frederic W. Erickson,
Erickson Engineering Co., Inc.

New York, N. Y.,
Nov. 11, 1930.

## *Dead Wood in Technical Societies*

Sir—Your recent editorial "Dead Wood in Technical Societies" is, I believe, very much to the point. When one's membership in an organization consists merely of the payment of annual dues, I wonder if either the membership or the organization is justified. Presumably the answer is that the dues of the inactive members aid the active members in carrying on the work (if any) of the organization. The value of this is debatable.

I have always felt that to be an active member of one or two organizations rather than a passive, dues-contributing member of a dozen organizations was an advantage both to the individual and to the organization.

A related subject, and one which I believe contributes to the passivity of some organizations, is that great American habit of electing the same very busy and very prominent man to active office in several organizations. Even in my limited experience I have seen the same man elected to office in (1) the local engineers' club, (2) the state organization and (3) the local section of a national society. It is very well to say that the busy man gets the most done, but there is a limit.

In the situation outlined above the man's interest is bound to be stronger in one of the organizations and hence he makes a poor officer for the others, and they suffer. A less prominent and less busy man would have time to be a better officer, and the busy man, not being bothered by any of the routine of office holding, would have more time to be a real contributor to the meetings.

Ames, Iowa, L. W. Mahone,
Oct. 8, 1930. Civil Engineer,
Technical Information Service,
Iowa State College.

# News of the Week

## Empire State Building Steel Topped Out at 1,248 Ft.

The closing truss in the roof of the observation tower of the Empire State Building in New York City was hoisted into place on Nov. 19, thus marking another high in the field of skyscraper construction. This observation tower, characterized also as an airship mooring mast, is 204 ft. tall above the roof of the 85th floor of the building. The final height of the completed steelwork above the Fifth Ave. curb is 1,248 ft. The 600 tons of steel in the observation tower was erected in fourteen working days. Rain and mist, which hid the tower from the street on several days, delayed steel hoisting somewhat, but in other particulars the work was executed in record manner.

## Court Upholds New York City's Power to Build Toll Structures

The Appellate Division, in a decision rendered Nov. 21, sustained the validity of the action of the board of estimate and apportionment of New York City in starting plans for the construction of the Triborough bridge, the Brooklyn-Staten Island vehicular tunnel, and the midtown tunnel in Manhattan and upheld the city's right to charge tolls for the use of these traffic outlets.

The majority opinion said: "Not only had the city the toll-fixing power to provide for the construction of revenue-producing public improvements, such as bridges and tunnels, but the exercise of such power in the present instance has been ratified and confirmed by the legislature."

## Corpus Christi Dam Fails With Loss of North Abutment Wall

THE new water-supply dam of the city of Corpus Christi, Tex., located on the Nueces River about 35 miles northwest of the town, failed during the afternoon of Nov. 23 with the loss of the north concrete abutment of the spillway section and about half of the earth embankment at that end of the dam. The damage, estimated at $100,000, is confined mostly to the dam. That no loss of life occurred is attributed to the sparseness of population and the fact that there are no towns in the valley between the dam and the sea. According to advices from John B. Hawley and S. W. Freese, of Hawley, Freese & Nichols, consulting engineers on the project, the cause of the failure was the apparent undermining of the north counterforted abutment wall. Major Hawley is of the opinion that a coastal earthquake reported to have occurred some three weeks ago might have sprung the joints in the interlocking steel sheetpiling cutoff wall under the dam, permitting excessive seepage under the base of the abutment.

### Description of the Dam

The dam, described in *Engineering News-Record* Oct. 2, 1930, p. 520, consists of two sections of rolled-fill embankment totaling 2,830 ft. long and containing 500,000 cu.yd. of fill, and separated by a concrete spillway 1,250 ft. long, of gravity section and having a maximum height of 42 ft. Both ends of the overflow section are flanked by counterforted reinforced-concrete abutments. The embankment crest is about 40 ft. above the average valley floor elevation, and the spillway crest is 22 ft. below the top of embankment. The entire dam rests on a gravel formation averaging 40 ft. deep. Under the embankment sections a sheetpile cutoff wall was driven from the bottom of a core trench through the gravel into a hard shale formation. The two abutments and the overflow section were founded on wood piles 25 ft. long. A sheetpile cutoff wall was driven under the upstream toe of the spillway section.

To create a cushion pool to dispel the energy of a possible overflow of 400,000 sec.-ft., the lower toe of the spillway section, terminating in a wide concrete apron, was lowered to an elevation 20 ft. below the valley floor, which brought the foundations of the masonry dam and the abutments 20 ft. lower than the average base of the embankment sections. Just where the break first occurred and what effect the difference in elevation between the foundations of the masonry and earth sections of the dam had on the subsequent damage are points of information not contained in reports received up to the time of going to press.

### To Be Repaired at Once

According to reports the dam will be repaired at once. The water supply of Corpus Christi is in no danger of exhaustion. The river below the dam is falling rapidly and a detailed inspection of the foundations of the structure will be made by the consulting engineers the latter part of this week after the waters have receded. The state board of water engineers is also making an investigation of the failure.

Bonney Photo

**MONUMENTAL DOUBLE-DECK CONCRETE BRIDGE NEAR BREST, FRANCE, OPENED OCT. 9**

**This structure crosses the Elorn River at Plougastel, where the river empties into Brest harbor, by means of three 612-ft. hollow concrete arches, the longest arches yet attempted in concrete. The truss superstructure is also of reinforced concrete, carrying a railway on the lower chord and a highway on the upper chord. The bridge, designed by the French engineer E. Freyssinet, was described in *Engineering News-Record*, Oct. 31, 1929, p. 691.**

## Manchester, England, Starts Long Water Tunnel

On Oct. 21 construction was started at Lakeland, England, on a 5-mile tunnel which will form part of the water supply system of Manchester. This will be one of the longest tunnels to be driven from only the two portals, without intermediate shafts. The work is expected to take three or four years for completion. The tunnel is a part of a project to carry water to Manchester from Hawes Water through an aqueduct 82 miles long, of which 30 miles will be tunnel. Construction of a dam to raise the lake at Hawes Water is also included in the plan, the total cost of which will be approximately $50,000,000.

## Railway Furnishes Water to Town

Water consumers in the town of Toyah, Tex., will be supplied through a new $1,000,000 pipe line recently completed by the Texas & Pacific Railroad from McCutcheon Springs, in the Davis Mountains, a distance of 38 miles. The 12-in. pipe line has a daily capacity of 1,000,000 gal., of which the railroad requirements will be only 200,000 gal. The balance, in accordance with a contract entered into between the railroad and the municipal authorities, will be available as a town water supply.

## New York Regional Plan Reports on Traffic Congestion

Separate skyscrapers and small groups of skyscrapers are exonerated as causes of traffic congestion in a report made public recently by the Regional Plan of New York and Its Environs under the heading "Building Bulks and Uses in Relation to Traffic." Blame for New York's traffic congestion is placed on the excessive bulks of buildings over large areas permitted by the present zoning laws.

It is pointed out that in midtown Manhattan, between 34th and 59th Sts., the average story height per unit of building plot is seven stories, which is likely to rise to between eight and nine stories by 1945—a height greatly in excess of what can be borne by the existing street system.

Property owners and merchants are declared to be the chief sufferers from the traffic congestion which they themselves cause by overbuilding. The difficulties in the way of automobile traffic in the midtown area are driving tenants and customers to other areas.

The Regional Plan urges as remedial measures that property owners should be compelled to provide space within their property for parking and for loading and unloading merchandise; the construction of bypass highways to eliminate through traffic from the streets; and requirement of setbacks on the street by stores which are responsible for an excessive amount of pedestrian traffic.

# Highway Officials Aid Publication of Association Data

TO MEET increasing demands for the publication of its specifications, which is now possible only through contributions, the Association of State Highway Officials, meeting in Pittsburgh, Pa., Oct. 17-20, revised its constitution to establish higher dues. Under the new article individual active members will pay $15 and associate members will pay $5. State highway department dues will be $250 for states whose highway funds are less than $10,000,000 a year; $350 for states whose funds are between $10,000,000 and $25,000,000, and $450 for states whose funds exceed $25,000,000. A further amendment to the constitution provides for the admission to membership of officials from Mexico and the Philippine Islands.

### Finances in Good Shape

The finances of the association were reported in good condition by the treasurer, who showed a balance of $20,732. The secretary's report, as summarized briefly last week, showed an increase in roads constructed of 5,715 miles over 1929. It was also reported that publication of the book "History of Road Building" had been provided for and that publication of the specifications for steel highway bridges and standard methods of sampling and testing highway materials will be undertaken soon after the first of the year.

Besides the special resolutions on emergency federal aid noted elsewhere in this issue, resolutions were adopted urging appropriations for public-land roads so as to make the present law effective. Other resolutions dealt with toll bridges, more nearly uniform gasoline taxes and motor license fees, restriction of vehicle taxes to road use, restriction of vehicle taxes to primar roads, cooperation between highwa and airway agencies, and highwa beautification.

### Officers Elected

The following officers were elected president, Henry H. Blood, chairman of the Utah state highway commission vice-presidents for the four districts—Jacob L. Bauer, state highway engineer of New Jersey; J. D. Waldrop, state highway engineer of North Carolina; S. C. Durkee, state highway engineer of Nevada, and George F. Shaffer, chairman of the state highway commission of North Dakota. W. W. Mack, state highway engineer of Delaware, was re-elected treasurer.

Among the entertainment features of the convention particular mention should be made of the trip over the Allegheny County highways; the complimentary luncheon given by the National Steel Fabric Co., the Blaw-Knox Co. and the American Tar Products Co., and the banquet under the auspices of the engineering societies of Pittsburgh.

## Phoenix, Ariz., to Improve Its Water System

Plans and specifications for the municipal water system improvement program of Phœnix, Ariz., have been distributed to contractors and prospective bidders. Construction projects involved include the laying of 31½ miles of water-supply line, ranging from 24 to 54 in. in diameter; laying of 8 miles of water distribution lines, ranging from 6 to 12 in. in diameter; and the construction of a new 10,000,000-gal. water-storage reservoir. Bids on a new city sewage system will be ready within 30 days.

NEW CONCRETE BRIDGE REPLACES OLD BRIDGE OVER CHESTER RIVER, MD.

**A new highway bridge across the tidal section of Chester River at Chestertown, Md., was opened to traffic on Nov. 11. The bridge replaces a pile and timber structure built between 1802 and 1821. It is of reinforced concrete, except the double-leaf bascule bridge over the navigable channel, which is of steel. The reinforced-concrete girders have a span of 33 and 35 ft. and are carried on bents of precast concrete piles. The bridge was built by the state roads commission of Maryland, H. D. Williar, Jr., chief engineer, and Walter C. Hopkins, bridge engineer. Construction was by Spencer, White & Prentis, with the Raymond Concrete Pile Co. acting as contractor for the pile work and the American Bascule Bridge Co. acting as contractor for the movable span over the navigable channel.**

## San Francisco Signs Contract for Emergency Water Supply

To avert possibility of water shortage should seasonal rains not be sufficient, the city of San Francisco has signed a contract with the East Bay Municipal Utilities District under which the latter agrees to supply San Francisco with water in case of an emergency. The agreement provides that San Francisco shall pay a stand-by charge of $292,000 regardless of how much water is taken. This money must be paid before June 1, 1931. San Francisco is to pay all charges as well as the cost of a pipe line from Newark to San Lorenzo, the cost of making the connections and the cost of pumping the water across the bay and through the Pulgas tunnel into Spring Valley lakes.

The city is not required to take the water in case it should not be necessary, but if it does take the water it must take not less than 5,000,000 gal. daily and it is limited to a total supply of 20,000,000 gal. daily. Water is to be paid for at the rate of 4c. per 100 cu.ft. The agreement runs for three years, during which period the Hetch Hetchy aqueduct and tunnel system is expected to be completed.

The San Francisco board of supervisors has appropriated $700,000 toward the construction of a pipe line to be laid from Newark to San Lorenzo, approximately 12½ miles, to connect the San Francisco municipal water system with the East Bay Water District system for the delivery of water in an emergency. A feature of the contract, which was recently awarded to the Western Pipe & Steel Company of California, is a $2,000 a day bonus, which will be paid to the contractor for every day less than 120 it takes to install the pipe line connecting the East Bay supply with that of San Francisco. The total expenditure for this emergency supply will be in the neighborhood of $1,096,000.

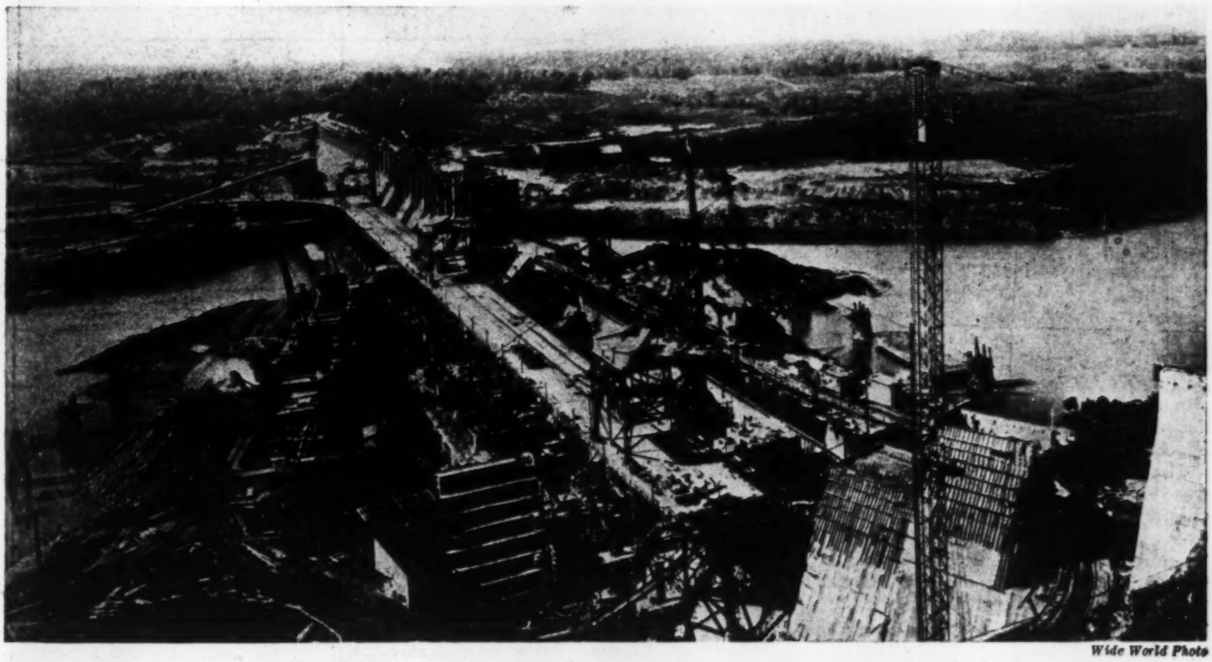
## Many Phases of Street Congestion Discussed

### City Traffic Problems and Their Remedies Form Theme of Special Meeting Held by Philadelphia Engineers—Eight Speakers Heard

WIDESPREAD interest in the problems incident to traffic regulation in cities was evidenced by the attendance of more than 250 persons at both afternoon and evening sessions of a meeting held Nov. 20 under the joint sponsorship of the Engineers Club of Philadelphia and the Philadelphia section, American Society of Civil Engineers.

At the afternoon session, presided over by Burton W. Marsh and Lemuel B. Schofield, traffic engineer and director of public service, respectively, for the city of Philadelphia, the opening paper was by Leslie J. Sorensen, traffic engineer, Chicago, Ill., on the subject "Parking and Loading." Parking, according to Mr. Sorensen, is less understood than any phase of the traffic situation, and its control arouses more opposition than does any other regulation affecting motor vehicles. As congestion increases, it is necessary to take three successive steps: (1) limit parking by means of time limits; (2) eliminate it on main arteries during rush hours; and (3) prohibit it absolutely throughout the congested area. These restrictions should be applied only after scientific study by a competent traffic authority. As an indication of the type of survey necessary, Mr. Sorensen cited the experience of Chicago, where a study of the utilization of 57,000 ft. of curb space was made at half-hour intervals and more than 96,000 persons were interviewed, as a preliminary to the prohibition of parking in the loop district. Other points brought out by Mr. Sorensen were that the provision of public garages and parking places is a necessary corollary to parking restrictions, and the fact that loading zones must be provided before double parking can be eliminated.

Problems incident to the mass transportation of persons by motor bus were reviewed by Carl W. Stocks, editor of *Bus Transportation*, who pointed out that in order to fulfill their proper function local buses must traverse heavily



Wide World Photo

**CONSTRUCTION PROGRESS ON BAGNELL DAM, OSAGE RIVER PROJECT**

**This concrete gravity-section dam is being built across the Osage River at Bagnell, Mo., by Stone & Webster, Inc., for the Union Electric Light & Power Co. It will be 2,543 ft. long, will contain 545,000 cu.yd. of concrete, and will have a maximum height of 148 ft. The power installation will consist of six units of a total of 201,000 hp. operating under a 90-ft. head. Work was started Aug. 6, 1929, the first concrete was poured April 21, 1930, and the complete plant is scheduled to be in operation Oct. 1, 1931. The reservoir impounded by the dam will contain 87 billion cubic feet of water and will form a lake 129 miles long having a shore line 1,300 miles long and covering 95 square miles. The present site of the town of Linn Creek will be inundated.**

traveled arteries, and that interference with bus operation by improperly timed signals or other causes results in serious delay to a large number of persons. Intercity buses which arrive and depart from terminals, on the other hand, can sometimes be rerouted profitably through minor thoroughfares. Mr. Stocks also voiced a warning that too great concentration of bus activities at a single center often results in serious congestion and delay.

### Transportation by Street Railways

Mass transportation of passengers by street railway was the subject presented by Dean J. Locke, research engineer for the United Electric Railway Co., Baltimore, Md. Mr. Locke cited figures showing that in Baltimore, during the evening rush hour, street cars aggregating only 5.7 per cent of the number of vehicles in the street carried 72 per cent of the number of persons leaving the business district. Private automobiles, on the other hand, aggregated 92.2 per cent of the traffic units and carried only 7.9 per cent of the passengers. By means of special studies and precautions the United Railway has reduced delay due to purely railway causes, such as mechanical difficulties, to a negligible figure, but the delays due to causes beyond the control of the trolley company are increasing at an alarming rate. As an example of the damage which can be done by ill-advised regulation, Mr. Locke stated that the monetary loss caused by delays at a single intersection with a poorly timed traffic light had been estimated at $104,000 a year. The futility of parking regulations without enforcement was shown by the fact that a survey in Baltimore revealed that 33 per cent of the parked vehicles in the downtown district were illegal as to time or place.

### Traffic Signs and Signals

The closing paper of the afternoon session was presented by Ernest P. Goodrich, consulting engineer, New York City, on the subject of "Traffic Signs, Signals and Markings." These, according to Mr. Goodrich, are the tools of the traffic engineer. The speaker pointed out that proper regulation of traffic is a complicated task requiring skill and experience, and that the function of the traffic engineer is to secure the necessary flow of traffic at the lowest cost.

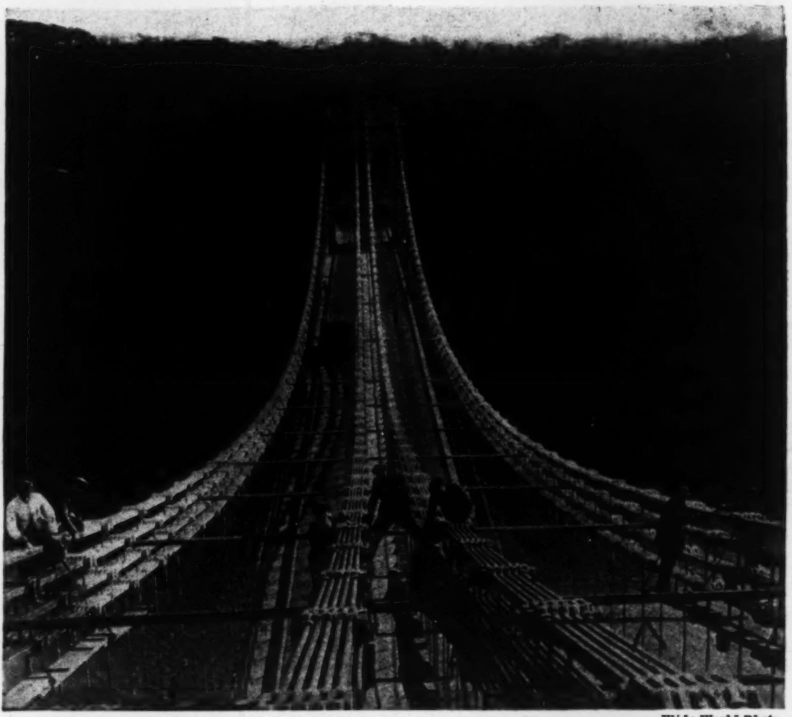
The evening session of the meeting was presided over by Philip C. Staples, chairman of the Philadelphia Traffic Commission. It was opened by a paper, "Uniformity in Traffic Regulations," by C. W. Stark, assistant manager of the transportation and communication department, U. S. Chamber of Commerce, who told of the development of model traffic laws by the National Conference on Street and Highway Safety. Mr. Stark pointed out that the enactment of uniform laws is only a part of the battle; true uniformity depends not only upon laws but also upon universal enforcement and proper education of the motorist.

Economic effects of traffic congestion and of the improvements made to reduce it were treated by Hawley S. Simpson, research engineer for the American Electric Railway Association, who cited some startling figures. In San Francisco, for example, it was found that 50 per cent of the cost of commonly used commodities was consumed in local transportation. In the typical city, according to Mr. Simpson, the carrying charge on the area occupied by one parked car is $5.76 a day, without considering the cost of paving or the loss due to interference with other vehicles. A study conducted in Washington, D. C., showed that it is necessary to drive an average distance of 0.9 mile to find a parking space in that city. Mr. Simpson stated that in most American cities the unused available space for off-street parking in the business district exceeds the number of vehicles customarily parked therein.

How an American city effected an outstanding example of accident reduction was outlined by Franklin M. Kreml, director of the accident prevention bureau, Evanston (Ill.) police department. In Evanston a series of accidents in 1928 led to the establishment of a bureau of accident prevention, which has succeeded in reducing automobile fatalities 50 per cent. The bureau maintains a spot map for recording accidents which is used as a guide to eliminate accident hazards. In addition, the map is used in directing the activities of motorcycle police. The bureau also conducts educational activities. Its outstanding function, however, is the prompt investigation of every automobile accident occurring within the city limits and the prosecution of those responsible. Activities of the accident prevention squads have resulted in the conviction of 80.62 per cent of the offenders arrested, including 73 out of 82 hit-and-run drivers. The automobile death rate per 100,000 in Evanston has been reduced to 9.5, as compared with rates of 23.9, 19.7 and 116.6 in the adjacent municipalities of Chicago, Wilmette and Niles Center.

### Supervision of Traffic Control Devices

The experience of Massachusetts in instituting state supervision of traffic control devices was outlined by Maxwell Halsey, state traffic engineer for the Massachusetts department of public works. The function of a state body, according to Mr. Halsey, should be supervisory rather than mandatory. The state should not command, but should act to prevent the institution of poorly conceived plans for traffic regulation. This must be done in a diplomatic way to avoid ill feeling on the part of municipal officials. The state traffic body can be of great utility by promoting uniformity in traffic control, serving as a clearing house of local experience and providing a fund of technical information which is not available to the individual municipality.



*Wide World Photo*

PAINTING THE MENAI STRAITS BRIDGE

**Workmen are now engaged in painting the famous bridge over the Menai Straits in the Anglesey district in north Wales. This bridge, one of the oldest suspension structures in the world, is a monument to the genius and engineering skill of Thomas Telford. It was begun in 1819 and finished in 1826. Its total length is 1,000 ft. and the span between piers is 550 ft. Clearance above water at its center point is 100 ft.**

## Smoke Abatement Campaign Begins in Hudson County, N. J.

William G. Christy, mechanical engineer of the board of education of St. Louis, Mo., has been appointed engineer in charge of the newly organized smoke abatement bureau of Hudson County, N. J., a new department of the board of health of that county. He will take office Dec. 1.

Hudson County's smoke campaign will be conducted in cooperation with Stevens Institute of Technology at Hoboken, where Elliott H. Whitlock, for the past six years smoke commissioner of Cleveland, Ohio, has been appointed to the chair of smoke abatement research. Mr. Whitlock will coordinate all smoke activities in various counties and municipalities of New York, New Jersey and Connecticut with the smoke abatement campaign in New York City.

The county has appropriated $40,000 for the first year's work. Mr. Christy will have full charge of the campaign, the budget for 1931 providing also for a deputy engineer and six smoke inspectors. Hudson County comprises fourteen municipalities across the Hudson River from New York City and includes Jersey City, Hoboken, Bayonne and Weehawken.

## Power Development in Abitibi Canyon, in Northern Ontario

The Ontario Power & Service Corporation is awarding contracts for the equipment of its power development at Abitibi Canyon, in northern Ontario, which will have a capacity of 275,000 hp. The Allis Chalmers Co., of Toronto, has been given the contract for five 66,000-hp. waterwheels, and the Dominion Bridge Co., of Montreal, has been awarded the contract for the five penstocks. Bids have been called for the five 55,000-kva. generators to be installed in the power house.

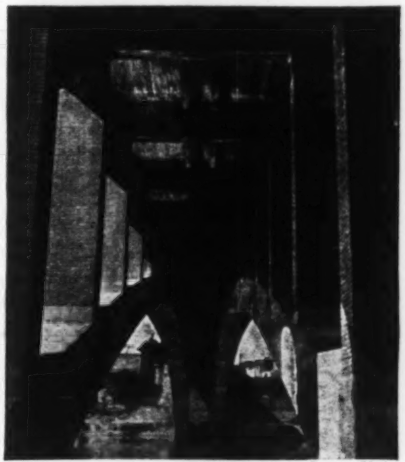
## Pioneer Crane and Shovel Builder of Milwaukee Dies

Henry Harnischfeger, president of the Harnischfeger Sales Corporation, of Milwaukee, Wis., died there on Nov. 15. His death brought to a close nearly a half century of active work in the development of cranes, power shovels and other excavating machinery.

A native of Germany, Mr. Harnischfeger came to this country in 1872 when seventeen years of age. Trained as a locksmith, he first obtained work as tool maker with the Singer Sewing Machine Co. Later he was employed by the Whitehill Sewing Machine Co. and when, in 1881, that company moved to Milwaukee he went there also. Three years later he formed a partnership with Alonzo Pawling in the tool- and pattern-making business under the name of Pawling & Harnischfeger. Their shop saw the beginning of several well-known manufacturing companies, notably the Chain Belt Co. and the Nordberg Manufacturing Co.

The early work of the firm included a considerable amount of pattern making for flour-milling machines and the manufacture of brewery equipment. Later, when H. A. Shaw developed his first electric cranes, Pawling & Harnischfeger entered into a contract with him for the manufacture of cranes according to his patented designs. When the contract expired, Mr. Shaw formed the Shaw Electric Crane Co., and began the manufacture of his own equipment, taking away a large part of the business of Pawling & Harnischfeger.

Hard times followed. After the panic of 1893 the Shaw patents were invalidated and the company again took up the building of cranes, including the electric motors and controllers. The manufacture of hoist and hand cranes was continued. In 1910 Mr. Pawling withdrew from active interest in the business due to failing health and a stock company was formed. In 1912 the company undertook its first contract for the construction of gasoline motors. It was followed by other contracts and subsequently the company undertook to adapt such motors to the trenching machines which it was developing. These studies led to the development of the crawler-type draglines and still later to the development of a successful gasoline shovel. It was during this period that Mr. Harnischfeger's son Walter began to take an active part in the affairs of the company. He now is its vice-president.



Bonney Photo

**BRICK SPANDREL COLUMNS ON FRENCH ARCH BRIDGE**

**The 322-ft. hollow concrete arch over the Lot River at Villeneuve, France, is a product of the Freyssinet method of construction—consisting essentially of leaving an opening at the crown of the arch in which hydraulic jacks are inserted for subsequent adjustment of the arch after rib shortening—now being used in this country by the Oregon state highway department on the Rogue River bridge. The use of brick spandrel columns is not unknown but is unusual.**

## Arguments Closed on Diversion of Delaware River Water

Hearing of arguments in the Delaware River diversion case before Charles N. Burch, special master of the U. S. Supreme Court, was concluded on Nov. 21 in Memphis, Tenn. The suit concerns the rights of the states of New Jersey, Pennsylvania and New York in the waters of the Delaware River, having been brought by New Jersey to restrain the proposed $275,000,000 project to divert from the river 600,000,000 gal. of water daily for New York City consumption. The next step in the litigation will be the filing of the report of the special master, after which the supreme court will hear the case upon possible exceptions to the findings and conclusions of the master.

## New Trunk Sewer for Montreal

The city of Montreal is ready to call for bids on three sections of the north end trunk sewer known as the Back River sewer, the total estimated cost of which is $7,500,000. The sewer, which was ordered by the provincial department of health, will drain the entire northern section of the island of Montreal. The division of costs between Montreal and the other municipalities to be benefited is to be taken up before the Quebec Public Service Commission. Including Montreal, ten municipalities are within the scope of the plan, which embraces a sewage-treatment plant as well as the main trunk sewers, sewer branches and stormwater overflows.

## Regional Street Traffic the Subject of Conferences

In a concerted effort to get results from the deliberations of the National Conference on Street and Highway Safety recently held in Washington, conferences sponsored by chambers of commerce and other bodies as a means of getting the proposed model laws and ordinances governing street and highway operation onto the statute books are being held throughout the country.

At the Washington meeting a dozen resolutions were adopted. The 30,000 toll of fatal accidents, and the loss due to congestion, delays and other inefficiencies were cited. Adoption of a drivers' license law was urged, as it is thought that such a law would effect a 25 per cent reduction in accidents. Adoption was also urged of the uniform model state code and municipal ordinance of the National Conference and of the standard manual of street traffic signs, signals and markings. Grade separation surveys to determine priorities were recommended. The savings from facilitation of traffic movement and reduction of traffic accidents through traffic engineering organizations is so great that expenditures for careful study and for putting into effect remedial measures were judged entirely justifiable.

## C. D. Vail Appointed State Highway Engineer of Colorado

Charles D. Vail, manager of parks and improvements of Denver, Colo., has been appointed state highway engineer by Governor Adams, to fill the vacancy caused by the death of Louis D. Blauvelt on Oct. 26. The appointment is subject to the approval of the state civil service commission, which it is said is assured.

Mr. Vail has been parks and improvements manager since 1923. Prior to that time he had a long career as engineer with the Union Pacific Railroad and in the U. S. surveyor general's office, at Cheyenne, Wyo.; with the Trinity, Cameron & Western Railway as locating engineer, at Georgetown, Tex.; as assistant engineer for the Oregon Short Line at Salt Lake City; as assistant engineer at Butte, Mont., for the Butte Water Co.; as locating engineer for the Chicago, Milwaukee & St. Paul Railroad; and as general manager at Ely, Nev., for the Ely Water Co. He went to Denver in 1908 and engaged in general engineering until 1917, when he became engineer for the state public utilities commission, resigning this position to enter the city's employ. He is a member of the American Society of Civil Engineers, the American Water Works Association and the American Association of Municipal Engineers. He is also a director of the county commissioners division of the American Road Builders Association.

## New York Erectors Sued by Steel Union for $3,500,000

Charging breach of contract, the International Association of Bridge, Structural and Ornamental Iron Workers on Nov. 21 filed suit in the supreme court of New York asking $3,500,000 damages from the Structural Steel Board of Trade (New York City). Specific charges are that the board has refused to live up to a contract agreement made May 12 last to use only union iron workers on New York building work. The several large steel erection contractors forming the Steel Board of Trade have been at odds with the steel workers' union for the past 25 years and have refused to employ union iron men on work in the metropolitan area.

The feud came to a head late last spring with the start of steel erection on the Empire State Building. According to the office of Frank P. Walsh, counsel for the International Association, former Governor Smith, president of the Empire State Co., requested, when the general contract for construction was signed with Starrett Bros. & Eken, that union iron workers be used. Upon the award of a subcontract for erection to Post & McCord, member of the Structural Steel Board of Trade and advocate of the open shop, sympathetic strikes were called throughout the country on all Starrett Bros. jobs. These strikes were called off upon advice from New York that the Empire State controversy would be settled to the satisfaction of the union.

Then, according to the union's counsel, an agreement in the form of a contract was drawn up providing for an end to the long dispute between erectors and the union and was approved by both sides after minor differences had been ironed out by William Green, president of the American Federation of Labor, acting as arbitrator. Though approved by the Structural Steel Board of Trade, the contract was never formally signed by the board officials. The Empire State job went ahead on an open-shop basis.

In bringing the suit for damages, the union contends that the contract is binding, even though not signed, as it was the intent and expression of the board to enter into the agreement. An injunction has been asked for by the union restraining the members of the board from hiring other than union men.

***The Business Outlook***

**The last few weeks of 1930 seem destined to show a virtual standstill in business activity. Production, employment and trade continue to compare unfavorably with preceding weeks and have small chance of improvement in the midst of prevailing hesitation. Announcement by the government of a 2 per cent decline in wholesale prices for October from September confirms the trend forecast by the weekly indexes. Hope of greater stability in prices appears chiefly in steel, copper and cotton markets. October foreign trade shows slight but steady improvement over the preceding two months.**
***—The Business Week, Nov. 26.***

## $100,000,000 Water-Works Expansion Under Way in U. S.

Returns from an informal questionnaire sent to officials in widely scattered cities throughout the United States by the iron and steel division of the department of commerce at the request of business organizations show that these cities have appropriated and in many instances expended so far this year approximately $100,000,000 on the improvement of their water-supply systems.

No comparable statistics are available for previous periods, but it is believed that the present figure is exceptionally large. Some cities have reported their expenditures as the highest on record. The replies indicate that the number of residents affected by this work is about 28,750,000 and the average expenditure per citizen in the reporting cities is just short of $3.50.

The appropriations reported include plans not only for the extension of pipe lines but also for the construction of dams, power and pump houses and filtration plants.

## Ten-Year Survey of Snake River Drainage Area Nears End

A ten-year survey of the water and power resources of the Snake River drainage area is now being completed, and reports will soon be made public, according to the announcement of W. G. Hoyt, hydraulic engineer of the United States Geological Survey.

The survey has located 100 dam sites for power development and 25 sites for water storage, according to Mr. Hoyt. The study has included a great part of Idaho and has been extended into Wyoming, near the headwaters of the south fork of the Snake, and into Oregon, where the Owyhee and other tributaries flow. The final work was done along the Salmon River.

Five months were spent on one of the major enterprises of the survey, the mapping and examination of the vast Snake River canyon below Homestead. Mr. Hoyt declares that this canyon is deeper and narrower—when its major width is considered—than the Grand Canyon of the Colorado. Reports on parts of the ten-year survey have been published, but hte entire report is expected to be brought out soon, following the conclusion of the work.

## Glendale, Ariz., to Vote on Power Company Franchise

Jan. 6, 1931, has been set by the city council of Glendale, Ariz., as the date for a special election on the proposed franchise of the Central Arizona Light & Power Co., of Phoenix. Following negotiations for several months between the power company and the city council with the objective of arriving at a satisfactory arrangement whereby the power company would take over the physical property of the Glendale system and thereafter furnish electricity to the municipality, the city council decided to approve the proposed franchise and submit it for approval of the voters.

Under the proposed franchise the power company agrees to reconstruct the entire electrical distribution system of Glendale; to convert or change the present 25-cycle apparatus and equipment of consumers now being served to 60-cycle equipment at no cost to the consumer; to construct two transmission circuits from its new steam plant to Glendale; to modernize the present overhead street lighting system; to build or purchase an office building in Glendale and maintain a trained personnel to give high-grade service to the community; to establish in Glendale the power rates in effect in Phoenix; to assist Glendale in securing new industries; to pay all expenses of the special election, and the cost of advertising incident to the calling of bids for the sale of the property.

The power company's offer includes an agreement to pay to the city $287,500 for the property. This purchase price would make possible a trustee fund sufficient to refund all of the city's outstanding bonds and leave a substantial sum.

## Brief News

Barge Canal Traffic on New York State's canal system for this year up to Nov. 16, according to an official report, reached a new high mark of 3,505,222 tons, an increase of 725,436 tons over 1929.

Installation of a turbine in the steam station at Long Beach, Calif., of the Southern California Edison Co., Ltd., is one of the items in the budget of the company for 1931. The turbine will have a capacity of 135,000 hp. The construction budget of the company for next year calls for an expenditure of more than $28,000,000.

Subways may be built in Montreal to relieve traffic congestion. Studies are now being made by the Montreal Tramways Co. and preliminary plans have been prepared for two subways, one running east and west through the city and the other north and south. The combined length would be about 7 miles, and the cost, it is believed, would be about $65,000,000.

Recently a line of 72-in. reinforced-concrete pipe 11,750 ft. long was completed for the Hidalgo County Water Improvement District No. 2 north of Pharr, Tex. This is part of an improvement program of 300 miles of concrete pipe for irrigation purposes to serve a well-developed tract of 70,000 acres of land in the extreme southern portion of Texas.

An Important hydro-electric undertaking on the Nipigon River in northern Ontario, which will result in the development of approximately 54,000 hp., is being brought to completion by the Ontario Hydro Electric Power Commission. One of the final stages of this project will be the closing of a 600-ft. earthfilled dam. The new dam is located at Alexander Landing, approximately 14 miles above Nipigon village.

## Progress on Proposed Road Into Alaska

Herbert H. Rice, of Detroit, assistant to the president of General Motors and treasurer and director of the National Automobile Chamber of Commerce, has been appointed chairman of the commission for the United States created to study the construction of a highway to connect the northwestern part of the United States with British Columbia, Yukon Territory and Alaska. The other members of this commission are Ernest Walker Sawyer, representing the department of the interior, and Major Malcolm Elliott, U. S. Army, president of the Alaskan road commission.

British Columbia is continuing exploration of a route for the proposed road 500 miles beyond its present terminus, near Hazelton, which is 839 miles north of Vancouver. The route from Hazelton, as indicated by recent surveys, will lead northwesterly to Lake Atlin and will enter Alaska by way of Dawson. At the northern boundary of British Columbia the road will enter Yukon Territory and its development through that area will be in the hands of the Canadian government. When the road reaches the Alaskan border its completion to Fairbanks will depend upon the U. S. government.

## American Roads in English Eyes

An English observer who attended the recent International Road Congress at Washington, reporting his impressions in *Municipal Engineering, Sanitary Record and Municipal Motor*, of London, makes some illuminating comments on American road and street practice, in the course of a rather disapproving review of the congress proceedings: "My personal conclusions may be crystallized as follows: United States engineers cannot teach British engineers anything about highways which they do not already know. The general conclusion arrived at would seem to be to the effect that in the States everyone concerned in road developments is working at high pressure, and that developments are proceeding at such a rate that in the future it may be that in the States public and private thoroughfares may achieve a success which will win the admiration of other countries."

## Society Calendar

**AMERICAN ROAD BUILDERS ASSOCIATION**, Washington; annual convention and road show, St. Louis, Mo., Jan. 10-16.

**AMERICAN SOCIETY OF CIVIL ENGINEERS**, New York City; annual meeting, New York, Jan. 21-23.

**ASPHALT PAVING CONFERENCE**, New York, City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

**ASSOCIATED GENERAL CONTRACTORS OF AMERICA**, Washington; annual meeting, San Francisco, Jan. 26-28.

**NATIONAL CRUSHED STONE ASSOCIATION**, Washington; annual convention, St. Louis, Mo., Jan. 19-22.

**NATIONAL PAVING BRICK ASSOCIATION**, Washington; annual meeting, Pittsburgh, Pa., Feb. 4-6.

**NATIONAL SAND AND GRAVEL ASSOCIATION**, Washington; annual convention, St. Louis, Mo., Jan. 27-29.

**ARIZONA SECTION**, American Society of Civil Engineers, at its annual meeting in Phœnix, Nov. 14, elected the following officers for the ensuing year: president, W. E. Dickinson, district engineer, U. S. Geological Survey, Tucson; first vice-president, R. G. Baker, designing engineer, Salt River Valley Water Users Association, Phœnix; second vice-president, R. A, Hoffman, bridge engineer, state highway department, Phœnix; secretary and treasurer, E. V. Miller, engineer of plans, state highway department, Phœnix. Active participation in the formation of student and junior civil engineer chapters throughout the state was recommended as one of the programs to be carried out. A state-wide meeting of engineers was called for December, the program to be arranged by Victor Householder, of Phœnix.

**ASSOCIATION OF PROFESSIONAL ENGINEERS** in the Province of British Columbia will hold its annual meeting on Dec. 6 in Vancouver.

**CAROLINAS BRANCH**, Associated General Contractors of America, will hold its annual convention Dec. 2-3 in Charlotte. N. C. Taxation, legislation and state policies concerning the utilization of convict labor will be the principal subjects of discussion. V. P. Loftis, of Charlotte, is secretary.

**NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS** will hold its annual convention at West Baden, Ind., May 5-7, 1931. The secretary is Roy M. Edmonds, St. Louis, Mo.

## Obituary

J. O. Eckersley, one of the veteran bridge designers in the service of the city of New York, died on Nov. 19 after an illness of only two days. He was 57 years old. Mr. Eckersley received a bachelor of science degree from Cooper Union in 1899 and a civil engineering degree in 1908. He also attended Columbia University. From 1899 to 1901 Mr. Eckersley was with the contracting firm of Terry & Tench, leaving it to enter the employ of the city of New York in the topographical bureau of the Bronx. In 1903 he entered the department of bridges, which became the department of plant and structures in 1916. Mr. Eckersley served continuously with this department until his death, except for the three years from 1924 to 1927, when he was chief engineer of the department of markets. He assisted in the design of the Queensboro and Manhattan bridges from 1902 to 1904, and in 1908, when the stresses in the Queensboro bridge were carefully checked following the Quebec bridge failure, Mr. Eckersley was placed in charge of the work. From 1906 to 1908 he taught mechanical and structural drawing and machine design at Cooper Union. At the time of his death, he was actively engaged in the design of the new Triborough bridge.

Wilkie Woodard, civil engineer, died Nov. 12 at his home in Bel-Air, a suburb of Los Angeles, after a prolonged illness, at the age of 57 years. Before going to southern California in 1910 he had been city engineer at Shreveport, La., and chief engineer for the Union Terminal and New York Central railroads. In California Mr. Woodard was chief engineer in charge of construction of Mulholland Drive and Sepulveda Boulevard. He planned the Bel-Air and Castellamare estates and achieved note for the groins he designed along the Santa Monica coast. At the time of his death he was chief engineer for the Santa Monica Mountain Park Co. and the Alphonzo Bell Corporation.

Charles Henry Markham, chairman of the board of the Illinois Central System, died at his winter home in Altadena, Calif., on Nov. 24 as the result of a series of paralytic strokes. He was 69 years old and had risen from section hand on the Santa Fe to the presidency of the Illinois Central. The most notable of his many improvements on the latter road was the electrification of the Chicago terminal. He resigned the presidency in 1926 and became chairman of the board.

Walter James Towne, chief engineer of the Chicago & Northwestern Ry., died of pneumonia on Nov. 24 at his home in Oak Park, Ill. He was 63 years old. After attending Rensselaer Polytechnic Institute in Troy, N. Y., Mr. Towne started as a rodman on the Santa Fe and made railroading his life work, except from 1896 to 1899, when he served as assistant engineer on the New York state canal.

# Construction Equipment and Materials

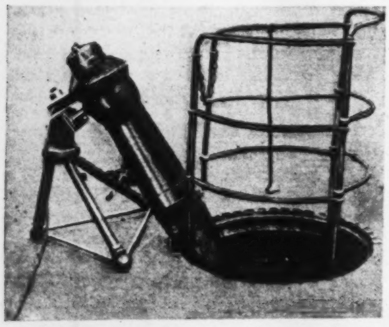
## Pneumatic Spray Outfit Paints Pipe Lines

Rapid and effective painting of the exterior of pipe lines without wasting material is the function of the model GV pipeline painter introduced by the Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill. The chief unit used is a curved multiple-tip spray gun through which the paint is discharged at right angles to the surface of the pipe. This coats one-third of the circumference at a time, three successive trips being made to complete a length of pipe. The gun is operated by means of compressed air supplied by a standard Sullivan portable air compressor to which is attached a paint tank and the necessary hose connection. The entire outfit is designed for mounting on a motor truck to facilitate transportation. A four-cylinder, four-cycle gasoline engine supplies power for the compressor. To prevent dilution of the paint with water from the compressed air, a separator is included in the outfit.

PIPE-LINE-PAINTING OUTFIT

## Electric Blower Clears Manholes

Removal of dangerous gases from manholes is facilitated by an electric blower unit manufactured by the Coppus Engineering Corp., Worcester, Mass. This consists of an electric-motor-driven blower of the propeller type equipped with stationary guide vanes designed to increase efficiency. The air current leaving the propeller is radially subdivided by the individual guide vane blades, which have a curvature increasing in the direction of rotation of the propeller. This serves to concentrate the current and give it a greater acceleration inside of the stationary guide vanes so that a considerable part of the pressure is produced in the latter. A large part of the end thrust is thus taken up by the stationary guide vane casing. As the equipment weighs less than 100 lb., it is easily portable. To put it into service it is merely necessary to make a connection with any convenient electrical outlet.



CLEARING GAS FROM MANHOLE

## Mortar and Cement Admixtures

Two new products which have been brought out by the Master Builders Co., Cleveland, Ohio, are termed Brikron, an admixture for masonry which minimizes efflorescence, waterproofs the joints, protects mortar colors from fading and prevents cracking and general disintegration of the joints; and Colored Metalicron, a material for coloring, slipproofing and waterproofing concrete floors. Brikron is a mixture of the company's product Omicron in combination with a powerful stearate waterproofing. This combination acts to arrest the formation of soluble salts and to prevent moisture streakage. Colored Metalicron is mixed with portland cement and troweled into the fresh cement floor.

## Electric Shovels Modified for Close-Quarters Work

Excavation under conditions where limited space is available is facilitated by a line of bobtail electric shovels announced by the Thew Shovel Co., Lorain, Ohio. The machines are offered in 1¼, 1 and ¾ cu.yd. sizes, and are essentially the well-known Lorain 75-B, 55 and 45 models, with some modifications. Short tail swing clearances are obtained by moving the electric driving motor, usually located at the rear of the turntable mechanism, to the front of the platform, where it is mounted on a special heavy-duty A-frame strut casting at the right side of the turntable. The silent chain power take-off which connects the motor to the Thew center drive unit is reversed. Standard full-sized motors are used. Proper stability is secured by means of a special counterweight extending along the back of the cab to a height of about 18 in.

Location of the power plant in the front makes possible the reduction of the model 75 tail swing clearance from 10 ft. to 6 ft. 6 in.; that of the smaller models is decreased from 9 ft. to 5 ft. 10½ in. A shovel unit equipped with a 12-ft. boom and a 10-ft. dipper stick can work in an opening 20 ft. wide and 15 ft. high, with boom at a 45-deg. angle. Shovel booms are available in 12, 14 and 16 ft. lengths; dipper sticks vary in length from 8 to 14 ft. The dippers used are either the standard design for the various shovel models, or a special rock dipper, shallow and extra wide, can be furnished.

BOBTAIL SHOVEL WITH 1¼-CU.YD. ROCK DIPPER

## New Publications

***Industrial Railways***—Track materials and rolling stock for industrial railway use are described in a 6-p. illustrated folder issued by the AMERICAN CAR & FOUNDRY Co., 30 Church St., New York City.

***Ventilation Design***—"Ventilating the General Science Building of Antioch College" is the title of an 8-p. illustrated Armco Architectural Bulletin No. 3 issued by the AMERICAN ROLLING MILL Co., Middletown, Ohio.

***Light-Weight Concrete***—"Design and Control of Haydite Concrete Mixtures" is the title of an 8-p. illustrated booklet of the HYDRAULIC-PRESS BRICK Co., St. Louis, Mo. As the title indicates, the bulletin contains suggestions for securing more satisfactory results with Haydite lightweight concrete.

***Concrete Accessories***—Form clamps and spacers, bar spacers, bolsters and chairs, screen chairs, sleeper anchors, and a multitude of other accessories for concrete construction are described in catalog 400, a 56-p. illustrated publication of the UNIVERSAL FORM CLAMP Co., 972 Montana St., Chicago, Ill.

## Costs and Contracts

### E. N.-R. Index Numbers

| Cost | | | Volume | | |
|---|---|---|---|---|---|
| Nov. 1, | 1930 | 198.54 | Oct., | 1930 | 211 |
| Oct. 1, | 1930 | 198.72 | Sept., | 1930 | 232 |
| Nov. 1, | 1929 | 208.46 | Oct., | 1929 | 273 |
| Average, | 1929 | 207.02 | Average, | 1929 | 317 |
| Average, | 1928 | 206.78 | Average, | 1928 | 287 |
| 1913 | ...... | 100.00 | 1913 | ...... | 100 |

### This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Nov. 27, with some comparisons, total as follows:

(In Thousands of Dollars)

| | Nov. 27, 1930 | Average of Last Four Weeks 1930 | Average of Last Four Weeks 1929 |
|---|---|---|---|
| Buildings: | | | |
| Industrial ..... | $1,545 | $5,100 | $10,046 |
| Other .......... | 13,242 | 22,507 | 31,634 |
| Streets and roads. | 6,783 | 6,571 | 7,231 |
| Other eng. constr.. | 5,975 | 13,328 | 10,505 |
| Total .......... | $27,545 | $47,507 | $59,417 |

Total, all classes Jan. 1 to Nov. 27:
1930 .................... $3,001,041
1929 .................... 3,789,107

# Unit Prices From Current Construction Bids

## Dredging in Long Island Sound, Conn.

DUCK ISLAND HARBOR, a small bay between Menunketesuck and Kelsey Points on the north shore of Long Island Sound, midway between and 23 miles from New Haven and New London, Conn., will be dredged to a depth of 17 ft. m.l.w. over an area 2,300 ft. long by 0 to 900 ft. wide. This area is sheltered by breakwaters extending west and north from the island. The material is mud and sand near the eastern end, the rest mud. The quantity, exclusive of an overdepth allowance of 1 ft., is 445,000 cu.yd.; maximum overdepth, 78,000 cu.yd. Soundings show 9 to 25 ft. of water, with an average of 10 to 12 ft. Mean tide range is 4.2 ft. Rate of progress is specified at 80,000 cu.yd. the first month, and an average of 100,000 cu.yd. thereafter. Center of dumping ground is 15,000 ft. south of the light on the west end of the breakwater west of Duck Island, and the area is 4,000 ft. square. Distance for disposal does not exceed 3½ miles and averages 3¼. All cubic-yard prices, received Sept. 12, are given below. Work is under supervision of U. S. Engineer Office, Providence, R. I.

For Removing 515,200 Cu.Yd.

| | | |
|---|---|---|
| Trimont Dredging Co. | $0.12⅓ | $63,541 |
| Morris & Cummings Dredging Co., Inc., New York | .1339 | 68,985 |
| Taylor Dredging Co., Jersey City | .14¾ | 75,992 |
| J. S. Packard Dredging Co., Providence | .1623 | 83,617 |
| Taylor & Pearson, Inc., Jersey City | .20 | 103,040 |
| Bay State Dredging & Contracting Co., East Boston | .223 | 114,890 |
| Great Lakes Dredge & Dock Co., New York | .225 | 115,920 |

## Items for Sewage Disposal and Outfall for Attica State Prison, N. Y.

A SEWAGE disposal plant and an outfall sewer for Attica State Prison, Attica, N. Y., to cost $91,045 were placed under contract Oct. 30, 1930, by the New York department of correction, T. F. Farrell, chief engineer. Details are shown in the accompanying drawing. The first unit price is for 9,050 cu.yd. excavation of all classes, to be used mainly for backfilling, for embankment for the sludge storage bed and around the structures and pipe. Additional fill is available at borrowpits on the site. Of the 1,270 cu.yd. concrete, 1,200 cu.yd. is class 1, of 1:2:4 mix, 6 cu.ft. aggregate to 1 of cement; stone or gravel ¼ to 2½ in. Class 2 concrete is 1:2½:5, 7½ cu.yd. per 1 of cement; ¼ to 1½ in.

The 138 tons of cast-iron pipe and specials are of the coated ball-and-spigot and flanged types in straight sections 12 ft. long. Pipe for water lines is class C; for sewers, class A. Contract prices for furnishing the pipe are $53 for pipe and $100 for specials. For placing, the prices vary from 20c. per foot for 3-in. to $1.25 for 16-in. All pipe above ground surface will be supported on concrete piers. Water pipe is placed at depths to provide a cover of 4½ ft. and is tested to 200 lb. before covering.

Vitrified pipe varies in price for furnishing and laying, from 25c. for 480 lin.ft. 4-in. to 90c. for 6,400 ft. 15-in. Pipe of 12-in. diameter or larger is double strength.

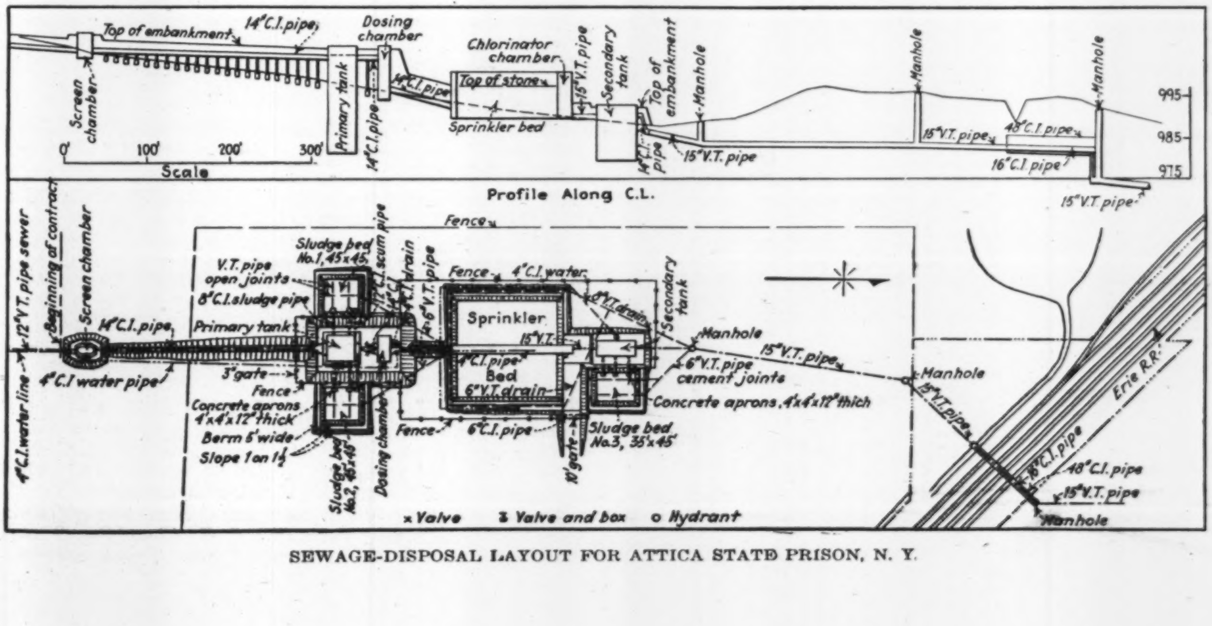
Manholes are brick with concrete bottoms and footings, or wholly of concrete. Prices are complete and cover nineteen manholes 10 ft. deep or less and fifteen manholes more than 10 ft. deep. Gate valves are iron-bodied, bronze-mounted, double-seat, with flanged, hub or spigot ends and inside non-rising stem. On water lines the valves are designed for 175 lb. working pressure; other valves, for 40 lb. Six fire hydrants are 4-in., anti-freezing and self-draining, and built for a working pressure of 150 lb. The 106 spray nozzles are of the screw-spindle type D of the Pacific Flush Tank Co. or equal, with ¾-in. orifices. The two 14-in. siphons are of the single adjustable, deep seal sewage type, to be set on 6x6-in. permanent concrete blocks fastened to the floor of the siphon chamber by steel reinforcing bars.

In the sprinkler beds and under the floors of primary and secondary tanks and sludge beds the contractor places broken stone or gravel. A 6-in. blanket is placed under the 15- and 16-in. sewer. Under the dosing chamber and the sprinkler bed and around the foundation drains for the bed, run-of-bank gravel is placed in 12-in. horizontal layers. Filter sand is placed over the broken stone in the sludge beds and under the floor of the settling tank.

The two chlorinators are manual-control, pedestal-mounted, dry-feed, each capable of supplying chlorine to the sewage at 10 to 50 lb. per 24 hours.

The 7-ft. fence is chain-link woven steel fabric 72 in. wide, manufactured by some reputable fence company.

In the roof of the pipe gallery are roof lights at least 2x8 ft., one over each pair of laterals. The lights are "Bar-Lock double reinforced-concrete sidewalk construction" or equal. Lenses are pure crystal annealed glass, and may be replaced without removing a whole section. Sections must


Top of embankment
14" C.I. pipe
Dosing chamber
Chlorinator chamber
Top of stone
15" V.T. pipe
Secondary tank
Top of embankment
Manhole
Manhole
Manhole
Screen chamber
Primary tank
14" C.I. pipe
Sprinkler bed
14" C.I. pipe
15" V.T. pipe
15" V.T. pipe
48" C.I. pipe
16" C.I. pipe
15" V.T. pipe
995
985
975
0' 100' 200' 300'
Scale
Profile Along C.L.
Fence
4" C.I. water line
12" V.T. pipe sewer
Beginning of contract
Screen chamber
14" C.I. pipe
4" C.I water pipe
V.T. pipe open joints
8" C.I. sludge pipe
Sludge bed No. 1, 45x45
Primary tank
3" gate
Fence
Concrete aprons 4'x4'x12" thick
Berm 5' wide
Slope 1 on 1½
Sludge bed No. 2, 45'x45'
Dosing chamber
12" C.I. scum pipe
14" C.I.
4" C.I. drain
6" V.T. pipe
Fence
4" C.I. water
Sprinkler Bed
15" V.T.
4" C.I. pipe
6" V.T. drain
6" V.T. drain
Fence
6" C.I. pipe
10' gate
Sludge bed No. 3, 35'x45'
Secondary tank
Manhole
15" V.T. pipe
6" V.T. pipe cement joints
Concrete aprons, 4'x4'x12" thich
Manhole
15" V.T. pipe
Erie R.R.
8" C.I. pipe
48" C.I. pipe
15" V.T. pipe
Manhole
× Valve
Valve and box
o Hydrant

SEWAGE-DISPOSAL LAYOUT FOR ATTICA STATE PRISON, N. Y.

be capable of carrying a live load of at least 150 lb. per square foot.

Twelve bids were received; unit prices are given of the lowest three bidders: A, William J. Gallagher, Meading, N. Y. (contract); B, Gundlach & Gundlach Contracting Corp., Williamsville, N. Y.; C, Riefler Brothers, Hamburg, N. Y.

| | A | B | C |
|---|---|---|---|
| Clearing: (lump sum) | $500.00 | $500.00 | $500.00 |
| 9,050 cu.yd. excav. | .75 | .80 | .80 |
| 50 M.ft.b.m. sheeting and bracing left in place | 1.00 | 65.00 | 10.00 |
| 4,200 cu.yd. embankment | .75 | .50 | .20 |
| 1,200 cu.yd. class 1 conc | 20.00 | 21.00 | 23.00 |
| 70 cu.yd. class 2 of conc | 15.00 | 21.00 | 15.00 |
| 111,000 lb. metal reinf | .04 | .04 | .05 |
| 1,550 sq.yd. mesh reinf | .60 | .90 | .60 |
| 112 ton furnish. c.i. pipe | 53.00 | 49.00 | 50.00 |
| 26 ton furnish. c.i. pipe specials | 100.00 | 130.00 | 180.00 |
| Laying c.-i. pipe and specials: | | | |
| 600 lin.ft. 3 in. | .20 | .55 | .30 |
| 2,500 lin.ft. 4 in. | .25 | .35 | .30 |
| 70 lin.ft. 6 in. | .40 | .50 | .50 |
| 360 lin.ft. 8 in. | .50 | .50 | .50 |
| 70 lin.ft. 10 in. | .80 | .75 | .60 |
| 100 lin.ft. 12 in. | .90 | .65 | .60 |
| 580 lin.ft. 14 in. | 1.00 | .65 | .60 |
| 1,050 lin.ft. 16 in. | 1.25 | .50 | .60 |
| Furnishing and laying vit. tile pipe: | | | |
| 480 lin.ft. 4 in. | .25 | .25 | .25 |
| 1,000 lin.ft. 6 in. | .35 | .30 | .25 |
| 120 lin.ft. 8 in. | .50 | .45 | .50 |
| 40 lin.ft. 12 in. | .70 | .80 | .60 |
| 6,400 lin.ft. 15 in. | .90 | 1.10 | 1.30 |
| 7,900 lin.ft. 12 in. | .45 | .27 | .30 |
| 19 manholes 10 ft. deep or less | 85.00 | 80.00 | 100.00 |
| 15 lin.ft. manholes, each add. foot over 10 ft. deep | 5.00 | 10.00 | 10.00 |
| 3 2½ in. gate valves with hose connections | 18.00 | 18.55 | 18.00 |
| 33 4 in. gate valves | 25.00 | 16.35 | 25.00 |
| 7 8 in. gate valves | 70.00 | 54.35 | 55.00 |
| 6 14 in. gate valves | 165.00 | 115.55 | 130.00 |
| 2 14 in. shear gates | 100.00 | 120.00 | 110.00 |
| 6 fire hydrants | 100.00 | 95.00 | 80.00 |
| 108 spray nozzles | 2.50 | 1.75 | 18.00 |
| 2 14 in. siphons | 250.00 | 975.00 | 325.00 |
| 3,500 lb. misc. metal | .15 | .10 | .10 |
| 2,350 cu.yd. gravel or broken stone | 2.50 | 2.35 | 2.50 |
| 780 cu.yd. run of bank gravel | 2.00 | 2.20 | 2.00 |
| 210 cu.yd. filter sand | 2.50 | 4.00 | 4.00 |
| 1,250 lin.ft. woven wire fence | 1.65 | 1.75 | 2.00 |
| Totals | $91,045 | $97,601 | $104,400 |

## Swing and Fixed Highway Bridges in Florida

FLORIDA state highway department awarded contracts in October, 1930, for a swing bridge over Dunnes Creek and two timber bridges over Toms and Rocky bayous, located in the northeastern and northwestern parts of the state. The swing bridge is a steel truss 162 ft. 1 in. center to center of rest piers, connecting at each end with three 33-ft. reinforced-concrete girder spans. Roadway is 20 ft.; bridge capacity, two 15-ton trucks. Foundations are concrete, the swing pier and rest piers on precast concrete piles. The material is muck and silt, sand, sand with shell. Concrete is class A, 1:2:4, 2,200 lb. after 28 days, and for piles class AA, 1:1½:3, 3,000 lb. Pile loading is 25 tons, and driving is by two water jets with steam-hammer, jet capacity 300 gal. per minute with pressure 200 lb. at pump.

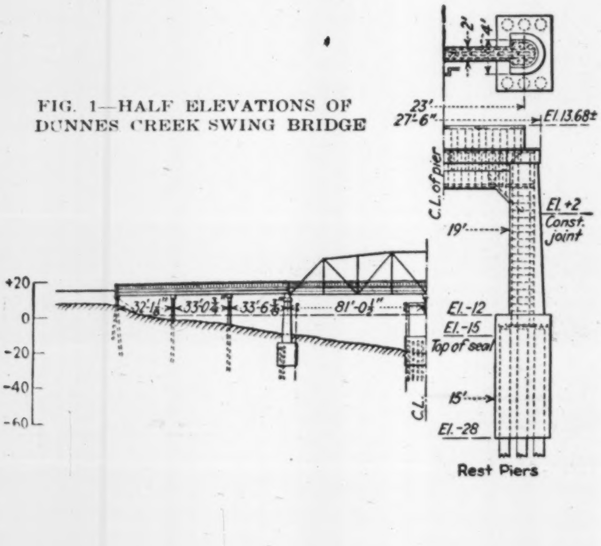


FIG. 1—HALF ELEVATIONS OF DUNNES CREEK SWING BRIDGE

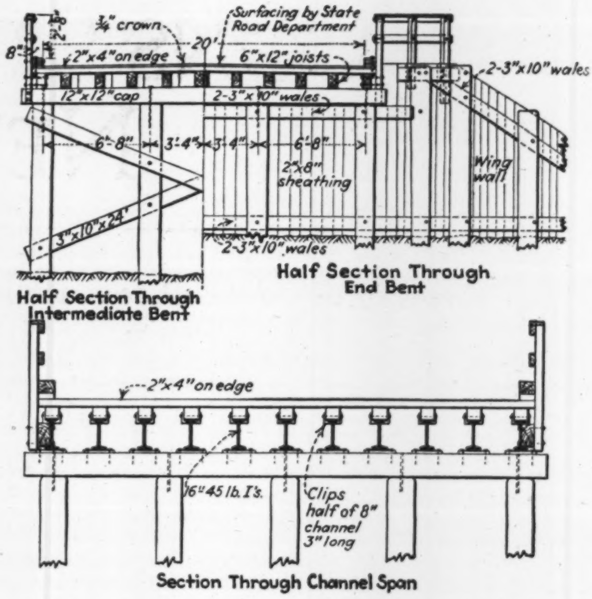


FIG. 2—SECTIONS THROUGH TOMS AND ROCKY BAYOU BRIDGES

The operating mechanism is designed by the contractor. It includes six balance wheels and latches, center wedges, and lifting wedges, and permits the span to be turned 360 deg. Wedges can be pulled in ½ minute and span can be turned through 90 deg. in three minutes by two men walking in a 12-ft. circle at 3 ft. per second.

Fig. 1 shows half-elevations of bridge and rest piers. Five bids were received, with a spread of 8 per cent, and 4 per cent between low and average. Unit prices are given in Table I of the lowest two bidders: (A) Atlantic Bridge Co., Greensboro, N. C. (contract); (B) Powell Bros., Inc., Fort Lauderdale.

TABLE I—BRIDGE OVER DUNNES CREEK

| | A | B |
|---|---|---|
| 7 cu.yd. concrete seal | $42.00 | $45.00 |
| 6 cu.yd. class A concrete substructure | 25.00 | 25.00 |
| 36 cu.yd. class A concrete superstructure | 25.00 | 30.00 |
| 416 lin.ft. concrete handrail | 4.00 | 3.60 |
| 116,500 lb. reinf. steel | .05 | .05 |
| 165,000 lb. structural steel | .0675 | .07 |
| 24,000 lb. machy. and castings | .30 | .24 |
| 44 M.ft.b.m. treated str. timber | 120.00 | 120.00 |
| 4,800 lin.ft. treated fender piling | 1.00 | 1.00 |
| 4,680 lin.ft. untreated found. piles | .60 | .70 |
| 1,880 lin.ft. precast conc. piles | 5.50 | 5.00 |
| 95 lin.ft. conc. test piles | 7.00 | 8.00 |
| Total | $82,228.00 | $83,104.00 |

TABLE II—TIMBER BRIDGES OVER TOMS AND ROCKY BAYOUS

| | A | B |
|---|---|---|
| 38,200 lb. structural steel | $0.05 | $0.05 |
| 37 M.ft.b.m. treated str. timber | 80.00 | 80.50 |
| 11 M.ft.b.m. untreated str. timber | 80.00 | 57.50 |
| 29,500 lin.ft. treated trestle piles | .70 | .76 |
| 40 M.lin.ft. treated bulkhead timber | 80.00 | 88.00 |
| Total | $56,552.00 | $58,584.00 |

The other two structures, over two bayous of Choctawhatchee Bay, are standard timber bridges 668 ft. and 1,298 ft. long, each with a 37-ft. channel span. Fig. 2 shows the construction. Bents are spaced on 15-ft. centers. Each bridge will carry a 10-ton truck. Bearing capacity of piles is 15 tons. All structural timber, including subfloor, but not bulkhead sheathing, is dense Southern yellow pine. Subfloor is built of 2x4s 21⅓ ft. long placed on edge. Each plank is toe nailed to each joist with one 40d. nail and nailed to subfloor timbers already in place with one 20d. nail every 24 in. Bulkhead sheathing is 2x8 in. coupled and nailed before driving, and extends 5 ft. below streambed.

Six bids were received and unit prices are given in Table II of the lowest two: (A) J. R. Chambliss, Tampa (contract); (B) R. G. Arrington & Son, Funiak Springs.

# CONSTRUCTION NEWS

## Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

| *Location* | *Project* | *Cost* | *Status* |
|---|---|---|---|
| **Bridges** | | | |
| New Jersey and Pennsylvania | Bridge | 4,000,000 | Proposed |
| Vancouver (B. C.) | Bridge | 1,739,547 | Contract |
| **Subways** | | | |
| New York | Vehicular tunnel | 85,000,000 | Proposed |
| Long Island City | Subway | 5,000,000 | Proposed |
| **Unclassified** | | | |
| British Columbia | Telephone circuit | 1,250,000 | Owner builds |
| **Buildings** | | | |
| Baltimore | Apartment | 1,000,000 | Owner builds |
| Philadelphia | Bank and office | 6,000,000 | Contract |
| Chicago | Club | 1,000,000 | Proposed |
| Newark, (N. J.) | Hospital | 1,500,000 | Proposed |
| Washington | School | 1,249,000 | Contract |
| Chicago | School | 1,500,000 | Bids asked |
| Quincy (Ill.) | School | 1,500,000 | Bids asked |
| Cambridge (Mass.) | Technical school | 1,500,000 | Proposed |
| Exeter (N. I | Academy | 1,000,000 | Proposed |
| Boston | Theatre | 2,500,000 | Proposed |
| Brookline (Mass.) | Theatre | 1,000,000 | Proposed |

## WATERWORKS

### PROPOSED WORK

**Ga., Cornelia**—New water supply development, incl. pumping station, filtration plant and mains. Robert & Co., Bona Allen Bldg., Atlanta, engrs. Bonds voted for same.

**Md., Baltimore**—City, 12,800 ft. 24 in. pipe under Belvedere Ave. from Park Heights Ave. to Roland Ave. $240,000; 5,000 ft. 30 in. mains in Riggs Ave. from Payson to Ashburton Sts., $150,000; 12 in. diam. water tunnel following line leading south from waterworks to 33rd St. to Montebello Lake, $250,000; 1,200 ft. 30 in. and 1,300 ft. 12 in. mains at Pennington Ave. Bridge, $40,000. E. G. Rost, Municipal Bldg., water engr.

**Mass., Raynham** — Town, new watermains. $20,000 or more. G. B. Leonard, chn. Bd. Selectmen.

**Mo., Clarkton**—Soon takes bids one 50,000 gal. tank on 125 ft. tower, 1 vertical turbine pump, 2,150 ft. 6 in. and 10,060 ft. 4 in. c.i. mains, 17 double nozzle fire hydrants, 8 in. diam. well, 50 ft. deep with 20 ft. brass strainer. $20,000 bonds voted for same. W. A. Fuller Co., 2916 Shenandoah Ave., St. Louis, engrs. Noted Oct. 30.

**N. H., Hanover** — Dartmouth College and Androscoggin Reservoir, 11 Lisbon St., Lewiston, Me., storage reservoir at Dartmouth College. $15,000 or more.

**N. Y., Brooklyn**—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, 2 story water pumping station, Neptune Ave. and Bay View St. $150,000. D. M. Metcalfe, Huntington, engr. and archt.

**N. Y., Catskill**—Village bids early in spring, additions to water system. Engineer not selected.

**O., Avon Lake**—Village, mains in Belmar and Redwood Blvds. $25,000. Warden & Launders, Elyria Bank Bldg., Elyria, engs.

**O., Lorain**—Bd. Control, soon takes bids purchasing, installing 4 electrical water pumps to have capacity 24 m.g.p.d., two 420 Diesel generators to supply power to new pumps. $97,500.

**Okla., Lawton**—Soon takes bids waterworks improvements, filtration plant, $300,000; improving distribution system, $100,000; improving extension flow lines $200,000. Burns & McDonnell Eng. Co., Interstate Bldg., Kansas City, Mo., engrs. Noted July 10.

**Pa., Bedministerville**—Community reservoir, water supply system.

**Tex., Houston**—Water Comrs., J. H. B. House, submitted plans for 1 m.g. reservoir at South End Pumping Station, $25,000.

**Utah, Logan** — Replacing wood pipe with 3,800 lin.ft. c.i. or steel pipe. $25,000. C. T. Barrett, city engr.

**Ont., Sarnia**—City, extending mains in George St. $40,000. W. H. Beatty, city engr.

**Ont., Simcoe**—See "Sewers."

**Ont., Sudbury**—For 6 in. c.i. mains in Spruce St.; 6- to 8-in. in Douglas and Albinson Sts.; 8 in. in Kathleen St. $20,039. W. McMullen, Mackie Belk., engr.

### BIDS ASKED

**Calif., Antioch**—Dec. 8, by J. E. McElheney, city clk., furnishing, installing horizontal pressure filter, enlarging building housing filters, other improvements. E. L. O'Hara, city engr.

**Calif., Beverly Hills** — Dec. 2, by B. J. Firminger, city clk., water treatment plant, furnishing, installing equipment for water treatment plant, underground pump chamber. Noted Nov. 6.

**Calif., Beverly Hills** — Dec. 2, by B. J. Firminger, city clk., deep well turbine pump.

**Calif., Coalinga**—Dec. 1, by E. J. McCroskey, city clk., 5,000 ft. 3 in. lap-welded pipe line (7.70).

**Calif., San Francisco**—Dec. 1, by L. S. Leavey, city purch agt., 30,000 ft. each 6 in. and 8 in. c.i. tar coated pipe made in United States, for Municipal Water Dpt.

**La., New Orleans**—Dec. 30, by Sewerage & Water Bd., 526 Carondolet St., Contr. 118-D, extension to Drainage Pumping Station 7. G. G. Earl, genl. supt.

**Mich., Pontiac** — Dec. 1, at office H. A. Maurer, city clk., City Hall, Proposal A, well No. 1; Proposal B, 2 wells, Nos. 1 and 2.

**N. J., Woodcliffe Lake** — Dec. 1, by Boro Council, water distribution system. $50,000. T. F. Bowe, 110 Williams St., New York, consult. engr.

**O., Dayton**—Dec. 4, by Comrs. Montgomery Co., Court House, 19,248 ft. 4- to 12-in. Class B and 30,790 ft. 4- to 12-in. Class C watermains, booster station, pumps, 500,000 gal. steel standpipe, 17 fire hydrants. Contrs. A. B. C. D. and E. Morame Sanitary Sewer Dist. and Water Supply. $75,000. P. E. Borchers, U. B. Bldg., co. sanitary engr.

**O., Steubenville**—Bd. Control, bids about Dec. 14, extending mains from filtration plant to Hollywood Blvd., incl. Franklin, Brady, Granard Aves. and Market St. $50,000. W. C. Sterling, Steubenville, engr.

**Okla., Wetumka**—Dec. 21, by W. H. Burkes, city clk., impounding reservoir, spillway, pipe line, pumps, 2 motor driven pump units, 9,000 ft. 8 in. c.i. mains, 40,500 cu.yd. excav. $65,000. Long & Co., 1300 Colcord Bldg., Oklahoma City, engrs. Noted Jan. 30.

**Tex., Houston**—Dec. 3, at office City Secretary, c.i. mains in 10th St. from Lowell to Allston Sts., Allston St. from 10th to 11th Sts., 11th St. from Allston to Yale Sts., Washington St., from Cappage to Durham Sts., Durham St. from Washington to Rodrigo Sts. W. E. Monteith, mayor.

**Utah, Midvale**—See "Contracts Awarded."

**Utah, Mountain Home** — See "Contracts Awarded."

**Wash., Tacoma** — City Comrs., bids about Dec. 9, replacing 16 in. with 18 in. c.i. mains on South Yakima Ave. from 19th to Division Sts. $49,500.

**Ont., Carleton Place**—See "Contracts Awarded."

**Ont., Haileybury**—See "Contracts Awarded."

**Ont., Pembroke**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Calif., Eureka**—Bd. P. Wks., 1,800 ft. 16 in. Class B. c.i. water pipe, to U. S. Pipe & Fdry. Co., Monadnock Bldg., San Francisco, at $2.13 per ft.

**Calif., Oakland**—East Bay Municipal Utility Dist., 9,800 ft. electric-welded sheet steel pipe, to Steel Tank & Pipe Co., 1100 4th St., Berkeley, $37,142.

**Conn., Hamden**—New Haven Water Co., 100 Crown St., New Haven, 2 tanks, 45 ft. long, 50 ft. diam., control house addition, to Barbara & D'Aurio Co., 63 Bank St., Waterbury. Est. $30,000.

**Ill., Chicago**—Bd. Local Impvts., City Hall, M. J. Faherty, pres., c.i. water supply pipes, special castings, c.i. fire hydrants and valves, brick valve basins in 94th St., to M. J. Bohan, 1105 West Garfield Blvd., Everell, Las Casas, Mankato, Medford, McAlpin and Caldwell Aves., to S. Ryan, 2927 West Congress St.

**Mass., Barnstable**—Town, concrete fire protection reservoir, 5 in. c.i. pipe, hydrants, Main St., to W. A. Jones, Barnstable. Est. $15,000.

**Neb., Lincoln**—City, 4 and 6 in. centrifugal c.i. and 10 in. Class C c.i. pipe for watermain connections to Huntington Ave., Havelock and E Sts., to A. A. Dobson Co., 824 1st Natl. Bank Bldg., $19,037.

**N. Y., Long Island City**—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Northern Blvd., to L. D. Gregory, 158 26th St., Brooklyn, $3,330. Noted Oct. 30.

**N. Y., New York**—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in 5th Ave., to Bronx Water Wks. Corp., 1 Riverdale Ave., $44,400. Noted Nov. 6.

**N. Y., St. George**—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Beverly Ave., to Empire Contg. Co., 21 Park Row, New York, $8,200. Noted Oct. 30.

**N. C., Jonesboro**—Town, drilling 10 in. deep well, to Dowdy & Butler, Sanford. Noted Nov. 13.

**Tex., San Antonio**—For 2½ m.g. steel standpipe, 75 ft. high for increased water pressure, Pittman-Sullivan Park, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $68,000.

**Utah, Midvale**—City will replace present distribution mains with 31,000 ft. 6- to 8-in. c.i. mains, day labor. $25,000. Will buy pipe in open market. A. B. Larsen, city engr. Noted Nov. 5 Daily.

**Utah, Mountain Home**—Farnsworth Canal & Reservoir Co. 600 ft. earth dam, 37 in. high, to store 4,000 acre ft. water, day labor. $42,000. Engineer not selected.

**Ont., Carleton Place**—Town, new watermains, sewers, day labor. $50,000. Pipe supplied by contract.

**Ont., Haileybury**—Waterworks to supply town with spring water, day labor. $20,000. Pipe supplied by contract.

**Ont., Pembroke**—Town, new watermains and drains, incl. 5,000 ft. 18 in. mains, day labor. $85,000. Pipe supplied by contract.

## SEWERS

### PROPOSED WORK

**Calif., Carpenteria**—Carpenteria Sanitary Dist., vitr. clay sewers. $25,000 or more. F. L. Johnston, 23 West Figuerio St., Santa Barbara, engrs.

**Ind., Connersville**—Sanitary sewerage system, disposal plant in Sewer Dist. B. $264,592. K. L. Hanson, Connersville, engr.

**Ind., Jeffersonville**—City Council, sewerage system. $65,000. P. Spurgeon, Jeffersonville, engr.

**Md., Hagerstown**—Sewers. $250,000, election soon for same.

**Mass., West Springfield** (br. Springfield) — Town, Bd. Selectmen, storm and sanitary sewer

*See proposal advertising on page 94*

# LEADITE

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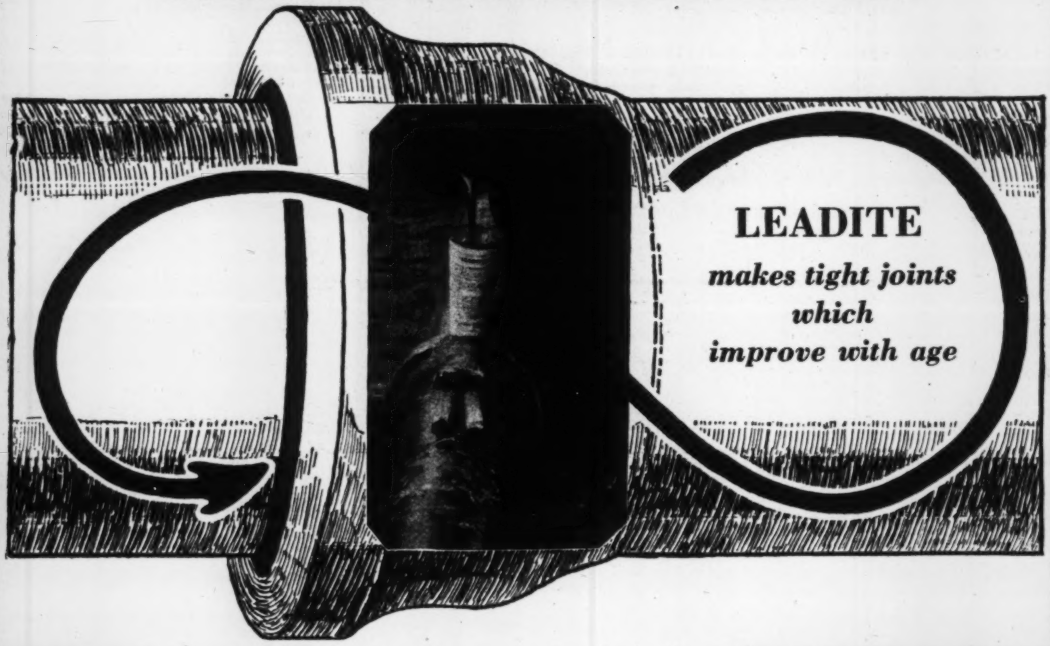

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## No Caulking

Sewers (Continued)

additions in Cold Spring A, Allison, Haywood, York, Westfield and River Sts. $25,000.

**N. J., Highlands**—Bd. Boro Council, Boro Hall, preliminary plans constructing, extending sanitary sewers. $50,000.

**N. J., Maplewood** — Milburn Twp., storm sewerage system in Short Hills and Brantwood areas and west of west branch Rahway River. $25,000 or more. E. Halsey, 75 Academy St., Newark, twp. engr.

**N. J., Woodbury**—Mayor and City Council storm sewer for drainage in three acres. $60,000. J. O. Carter, Woodbury, engr.

**New York** — G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., Long Island City, sewers to follow proposed subway along Queens Blvd. from 55th Ave. to 64th Rd., Long Island City, to Jamaica, $750,000.

**Ont., Fort William**—For 2,000 ft. 5 ft. concrete circular sewer in Gore St. from Home St. to Mountain Ave. $30,000. C. B. Symes, city engr.

**Ont., Hamilton**—City Council vitr. tile or concrete storm water relief sewer in Main St. $25,000. W. L. McFaul, city engr.

**Ont., Simcoe**—Council storm sewers in Head and Union Sts.; sanitary sewers in Cedar, Metcalfe, Queen and Windham Sts.; water mains in Queen St. N. and Main St. $45,000. G. R. Marston, Town Hall, engr.

**Ont., Toronto** — East York Twp., sanitary sewers in Rosemount Heights Sewer Area, Sect. A, incl. Hillside, Lumley, Bayview and Noel Aves., Bennington Heights Dr., Heath St. and Burnham Rd., $53,756; storm sewers in same area, $38,150. W. H. Eaton, twp. clerk.

### BIDS ASKED

**Ill., Chicago**—Dec. 2, by City, at office Bd. Local Impvts., City Hall., system, brick and tile sewers, brick manholes, catch basins, in West 75th, 76th, 77th and 78th Places, West 75th, 76th, 77th and 78th Sts., South St. Louis, South Sawyer, South Spaulding, Turner, South Homan, South Trumbull and South Central Park Aves. M. J. Faherty, pres.

**Ill., Chicago**—Dec. 11, by H. E. Hoff, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., R. A Woodhull, chn. Finance Com., West Side Sewage Treatment Works, Division AA.; adv. E. N.-R. Nov. 27.

**La., Baton Rouge**—Dec. 16, by City Council, 22 mi. 8- to 30-in. sewers, up 26 ft. deep. L. J. Voorhies, City Hall, consult. engr. Noted Nov. 21.

**Md., Towson**—Dec. 1, by Comrs. Baltimore Co., Court House, furnishing, laying vitr. sewer, appurtenances as follows, 14,460 lin.ft. 8 in., 1,340 lin.ft. 15 in., 3,400 lin.ft. 18 in., 1,750 lin.ft. 24 in. T.C. sewer, 3,733 lin.ft. 6 in. T.C. house connections, 737 vert.ft. brick manholes, etc., Contr. 22-S, West Catonsville. B. L. Crozier, Court House, ch. engr.

**N. Y., Rome** — Dec. 8, by Bd. Estimate & Contr., sewerage development. H. W. Taylor, 11 Park Pl., New York, consult. engr. Noted Nov. 21.

**O., Cleveland**—Taking bids sewer in Kinsman Rd. from East 116th to East 149th Sts. To exceed $50,000. R. Hoffman, City Hall, engr.

**O., Kent,**—Bd. Control, bids about Dec. 18, sanitary sewerage system in 130 acre area, southeast section city. $25,000. A. Ranney, Kent, engr.

**Tenn., Knoxville**—Dec. 1, by W. W. Mynatt, dir. P. Wks., 39,000 ft. 6- to 12-in. sewers, Broadway Lateral 1. $85,000. H. J. Wight, City Hall Park, engr.

**Wis., Milwaukee**—Sewerage Comn., bids about Dec. 15, complete conveying system of sludge, incl. motors and speed reducers, in dryer house, sewage disposal plant. $50,000.

### CONTRACTS AWARDED

**Conn., Waterbury**—City, general contract final section trunk sewer in Browns Meadows, to Cendella & Co., 68 School St., Milford; pipe, to Lockjoint Pipe Co., Ampere, N. J. Est. exceeds $25,000.

**Kan., Osawatomie**—J. W. Allard, city clk., City Hall, 5,485 ft. 8 in. and 4,521 ft. 12 in. clay or cement concrete sewer pipe for sanitary sewer, mains, laterals, to E. E. Humphrey, 1300 Washington St., Kansas City, Mo., $8,862. Noted Oct. 23.

**N. J., Ocean City**—Bd. City Comrs., City Hall, sanitary sewers in streets from 16th to 36th St. and from Bay Ave. to ocean front, to Eastern Eng. & Constr. Co., 44 North Carolina Ave., Atlantic City, $173,138. Noted Nov. 6.

**New York** — Westchester Co. Sanitary Sewer Comn., White Plains, Sect. J, pumping plant, appurtenances, for Hutchinson Project, near Hutchinson River, Mount Vernon, to Merritt, Chapman & Scott, 17 Battery Pl., New York; Sect. K, heating system and Sect. L, plumbing system to A. H. Karl, 282 East 3rd St., Mount Vernon. Noted Oct. 16.

**New York**—Westchester Co. Sanitary Sewer Comn., Court House, White Plains, Sect. K, Sawmill Project Trunk Sewer, to A. Cianciulli, 922 Nepperhan Ave., Yonkers. Noted Oct. 23.

**N. Y., Syracuse** — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, sanitary sewers in Peat St. Yards, to Walsh Constr. Co., Herald Bldg., for City and Grade Crossing Comn., $55,618.

**O., Cleveland**—City, 1,850 ft. 5 ft. circular brick intercepting sewer in Ridge Rd., to Middle West Constr. Co., Leader Bldg., $44,974; 1,845 No. 7-E brick sewer in Walworth Run, to Carroccio & Gaudio, 14109 Benwood Ave., $74,640.

**Wis., Wauwatosa**—City, to P. D. Johnson, 821 36th St., storm sewers in West North Ave., $6,674; to T. G. Holton, 811 South 32nd St., Beverly Pl., $1,676, Underwood Lane, $701; to Wisconsin Sewer Constr. Co., 946 30th Ave., Swan Blvd., $3,352, High Rd., $156, Moore Ave., $1,536; to J. Volpano, Waukesha Ridge Lane, $632; to T. G. Holton, in Glen Ave., $844, Crescent Ave., $2,719, Harding Dr. $2,719; to H. O. Schaeffer, Inc., 79th and Slinger Ave., West Allis, Menomonee Dr., Part 1 $1,715, Part 2 $952; to Street Lighting Service Co., 7917 Rhodes Ave., Chicago, Ill., ornamental lighting system $15,960. Grand total $40,440.

**Ont., Carleton Place**—See "Waterworks."

## WASTE DISPOSAL

### PROPOSED WORK

**Que., Montreal** — City, incinerator in West Division. $500,000.

### BIDS ASKED

**Ont., Ottawa**—City, Secretary Bd. Control, bids about Jan. 1, two 100 ton daily capacity incinerators, 1 on Lees Ave. and other in west end city. $300,000. A. F. Macallum, City Hall, engr.

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## BRIDGES

### PROPOSED WORK

**Calif., San Francisco** — Golden Gate Bridge & Hy. Dist., 690-A Market St., toll bridge over Golden Gate Strait. Strauss Eng. Co., 307 North Michigan Ave., Chicago, Ill., and 609-A Market St. and DeYoung Bld., engr. Noted Nov. 13.

**Colo., Pueblo**—See "Railways."

**New Jersey** and **Pennsylvania**—States of New Jersey and Pennsylvania bridge over Delaware River from Yardley, Pa., to Wilburtha, N. J. $4,000,000. **Maturity indefinite.**

**N. J., Paterson**—Bd. Freeholders Passaic Co., Court House, steel bridge over Passaic River, on Spruce St. $25,000. G. Ferguson, Court House, co. engr.

**N. J., Salem**—Bd. Freeholders Salem Co., Court House, bridge at Courses Landing. $85,000. H. B. Keasbey, Salem, co. engr.

**Okla., Arapahoe**—Custer Co., steel, rein.-con. bridge over South Canadian River. $300,000. R. James, 519½ West Main St., Oklahoma City, engr.

**Okla., Heavener**—State Hy. Dpt., Oklahoma City, preliminary plans 6 span 110 ft., rein.-con. bridge, LeFlore Co., near here. $30,000. A. R. Losh, ch. hy. engr.

**Okla., Hominy** — State Hy. Dpt., Oklahoma City, preliminary plans 6 span 110 ft. rein.-con. bridge over Hominy Creek, Osage Co. $25,000. A. R. Losh, ch. hy. engr.

**Tex., High Island**—Atichison, Topeka & Santa Fe R.R., G. W. Harris, ch. engr. system, Chicago, Ill., 120 ft. span single leaf bascule bridge for single railroad track over Intercoastal Waterways. $125,000. Scherzer Rolling Lift Bridge Co., 53 West Jackson Blvd., Chicago, Ill., engrs.

**Wash., Seattle** — Northern Pacific Ry. Co., B. Blum, ch. engr., St. Paul, Minn., 1,000 ft. steel bascule type bridge, timber approaches over Duwanish River, Spokane Ave. $350,000.

**Que., Montreal**—City, bridge on Boulevard St. Joseph. $500,000.

### BIDS ASKED

**Calif., Pulga**—Dec. 3, by State Hy. Comn., Sacramento, steel bridge with concrete deck to have 349.95 ft. steel arch span one 82.14 ft., one 79.06 ft., two 62.51 ft. and one 44.02 ft. plate girder spans over North Fork Feather River, Butte Co. C. H. Purcell, state hy. engr.

**Calif., San Diego**—See "Streets and Roads."

**Ind., Michigan City**—Bd. Comrs., Laporte Co., Laporte, bids about Dec. 19, 150 ft. span double leaf bascule bridge, 36 ft. roadway, two 8 ft. sidewalks, at Franklin St. $300,000. Scherzer Rolling Lift Bridge Co., 50 West Jackson Blvd., Chicago, Ill., engrs. Noted Nov. 6.

**Ind., Richmond** — Dec. 18, by Bd. Comrs. Wayne Co., 826.5 ft. rein.-con. bridge, 47 ft. over White Water River, on South G St. $272,000. G. F. Gault, Richmond, engr.

**Me., Boothbay**—Dec. 3, by State Hy. Dpt., Augusta Knickerbocker Bridge, concrete, steel.

**Maryland**—Dec. 2, by State Roads Comn., Baltimore, G. C. Uhl, chn., extending triple span concrete girder bridge, Contr. M-162-511, Montgomery Co. L. H. Stuart, secy.; adv. E. N.-R. Nov. 27.

**Michigan**—Dec. 2, by H. G. Rose, div. engr., Grand Rapids, MBr. 1 of 3-17-8, Contrs. 1 and 2, 2 rein.-con. abutments, steel deck girder, Allegan Co., for State Hy. Comn., Lansing.

**Michigan**—Dec. 2, by H. G. Rosh, div. engr., Grand Rapids, MBr. 2 of 3-17-8 Contrs. 1 and 2, 2 rein.-con abutments, steel deck girder span, Allegan Co., for State Hy. Comn. Lansing.

**Michigan**—Dec. 3, by H. F. Anderson, div. bridge engr., Cadillac, MBr. 1 of 24-1-1 Contr. 1, 7 spans, 2 rein.-con. aboutments, rein.-con. superstructure, T-beam type., Emmet Co., for State Hy. Comn., Lansing.

**Minnesota**—Dec. 5, by State Hy. Dpt., St. Paul, Bridge 3954, on S.P. 9-35, at Hokah, Houston Co.—Bridge 5029, Bridge 5030, and Bridge 5044, on S.P. 61-23, Koochiching Co. south of Big Falls.

**Missouri**—Dec. 2, by State Hy. Dpt., Jefferson City, bridges in Adair, Bollinger, Cedar, Clark, Dent, Dunklin, Gasconade, Henry, Iron, Knox, Lewis, Lincoln, Mercer, McDonald, Pike, Scotland, Shannon, Stone, Sullivan, Taney, Washington and Wright Counties. T. H. Cutler, ch. engr.

**N. J., Mantoloking** — Bd. Freeholders Ocean Co., Court House, Toms River, bids about Dec. 1, creosoted pile and timber bridge with steel span and jacknife draw over Barnegat Bay, from Mantoloking to West Mantoloking. $200,000. H. C. Shinn, Municipal Bldg., co. engr. Noted Nov. 13.

**N. Y., New York**—Dec. 4, by A. Goldman, comr. Plant & Structures, Municipal Bldg., reconstructing under floor and roadway of Bronx approach of Macombs Dam Bridge over Harlem River.

**North Carolina**—Dec. 9, by State Hy. Comn., Raleigh, rein.-con. bridges on Project 2060, Craven Co., $66,000; Project 6693, Rowan Co., $32,400. J. D. Waldrop, Raleigh, engr.

**O., Warren**—Bd. Comrs. Trumbull Co. taking bids bridge improvements, incl. new brick paving, concrete railing, sidewalks, concrete work and guniting for bridge on Summit St. $25,000. W. P. Brown, Finance Bldg., Cleveland, engr.

**Ore., Marshfield**—Dec. 8, by Coos Co. Court, Coquillie, 1.713 mi. concrete, steel viaduct over Islmas Slough and Coos Bay, near here. $300,000.. Noted Apr. 24.

**Texas**—Dec. 1, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges on Hy. 20-A, Gillespie Co., $37,800.

**Texas** — Dec. 1, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges on Hy. 34, State Project 859-H, Jack Co., $41,400; Hy. 15, Federal Aid Project 363-D, Van Zandt Co., $30,000.

**Utah** — Dec. 1, by State Road Comn., Salt Lake City, widening 30 concrete bridges on North and South State Hy. between Ogden and Provo, Davis, Salt Lake and Utah Counties. $31,000. H. S. Kerr, state engr.

**Wis., Kaukauna**—State Hy. Comn., Madison, bids about Jan. 1, substructure, arches, bridge at Lawe St. Scherzer Rolling Lift Bridge Co., engrs., 52 West Jackson Blvd., Chicago, Ill., preparing plans superstructure of same, $100,000. Noted Dec. 5.

**Ont., Chatham**—Bids about Dec. 8, superstructure 60 ft. span, double leaf bascule bridge, 40 ft. roadway, two 6 ft. sidewalks over Thames River, at 5th St. Noted Apr. 10.

### CONTRACTS AWARDED

**Arkansas**—State Hy. Dpt., Little Rock, to Altman-Rodgers, Cotton-Grain Exch. Bldg., Oklahoma City, Okla., 8 rein.-con. deck girder and truss bridges, concrete piers, abutments, Clark Co., $110,133 est. $163,700; 9 rein.-con., deck girder bridges, concrete piers, abutments, Hot Springs Co., $60,914 est. $90,800; 6 rein.-con. deck girder bridges, precast concrete piles, abutments, Lonoke Co., $43,614 est. $58,500; 2 rein.-con. deck girder bridges, concrete piers, St. Francis Co., $70,176 est. $93,000—to F. Luttjohann, Topeka, Kan., 4 rein.-con. deck girder, steel truss bridges, concrete piers, abutments, White Co., $30,204 est. $59,700 — to Gauger-Korsmo Constr. Co., Fidelity Bank Bldg., Memphis, Tenn., 4 I-beam concrete deck girder bridges, treated timber pilings, Union Co., $52,122 est. $65,000. Grand total $367,163. Noted Nov. 13.

**Indiana** — State Hy. Comn., Indianapolis, 2 rein.-con., steel bridges in Tipton Co., to J. C. Jarrett, Lynn, $12,069 est. $15,062; 4 rein.-con., steel bridges Bartholemew and Jennings Counties, to A. E. Hutten, North Vernon, $44,958 est. $64,520.

**Ill., Chicago**—City, at office Dpt. P. Wks., City Hall, filled approaches and street improvements and adjustments to double leaf trunnion bascule bridge at North Wabash Ave., to W. J. Newman Co., 21 North Curtis St., $165,912. Noted Oct. 9.

**Iowa**—State Hy. Comn., Ames, 90 x 20 ft. pony truss bridge, two 40 x 20 ft. I-beam approaches, Grundy Co., to C. J. Kramme Co., Ft. Dodge, $14,700—2" I-beam bridges, one 70 x 20 ft. pony truss bridge with four 32 x 20 ft. I-beam approaches, 49 culverts, extensions, Grundy Co., to Waugh & Tackman, Clarksville, $33,295—60 x 20 ft. pony truss bridge, Grundy Co., to A. Emmert, Grinnell, $7,064 — slab bridge extension and 3 I-beam bridges, Iowa Co., to M. O. Burnett, Marengo, $16,714—120 x 20 ft. high truss bridge with twelve 40 x 20 ft. I-beam approaches, Iowa Co. and 160 x 20 ft. high truss bridge with four 40 x 20 ft. approach spans, Jones Co., to P. Jayne, Cedar Rapids, $37,066 and $23,744 respectively—50 x 20 ft. pony truss bridge, Jones Co., 38 Culverts Iowa Co., to F. Russell & Son, Waukon, $6,675 and $15,700 respectively—31 culverts, extensions Grundy Co., to C. Jensen, Thompson, $10,000—19 culverts, extensions, Hardin Co., to H. T. Stillman, Ames, $6,600—7 culverts, extensions, Monroe Co., to G. Jordon, Centerville, $1,439. Grand total $172,997. Noted Nov. 6.

*Constr. News page 219a*

Bridges (Continued)

**Kansas**—State Hy. Comn., Topeka, at Court House, Ft. Scott, bridge in Haskell Co., to Thogmartin & Reis Constr. Co., Ft. Scott, $42,567.

**Kan., Newton**—C. A. Young, clk. Harvey Co., Court House, Bridges 7, 8, 9 and 12, on Buhler, Whitewater and Township Rds., to E. W. King, Hesston, $28,092. Noted Oct. 23.

**Maryland**—State Roads Comn., Baltimore, G. C. Uhl, chn., substructure alterations for bridge over Monocacy River, Contr. F-142-57, Frederick Co., to Whiting Turner Contg. Co., Stewart Bldg., Baltimore, $20,250. Noted Oct. 30.

**Maryland**—State Roads Comn., Baltimore, G. C. Uhl, chn., grading, timber bridges for approaches to bridge over Nanticoke River, Contr. D-68-17, Dorchester Co., to Sanford & Brooks Co., Canton House, Baltimore, $67,988. Noted Oct. 30.

**N. Y., Mount Pleasant**—Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, 3 stone faced rein.-con. bridges, Contr. to J. S. Quinby, Bedford Rd., Chappaqua. Noted Nov. 6.

**N. Y., Brooklyn**—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, Harway Ave. Bridge, to W. H. Gahagan, Inc., 47 Remsen St., $664,000. Noted Nov. 6.

**N. Y., White Plains** — Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced rein.-con. overcrossing and 2 adjacent river bridges, at Main St., to A. Riegel, Brockway Pl. Noted Oct. 23.

**N. C., Wilmington** — Tidewater Power Co., single leaf bascule bridge, inland waterway, to Al. S. Fox & Co., 24 North Canal St., Dayton, O., $100,000. (Scherzer Rolling Lift Bridge Co., 53 West Jackson Blvd., Chicago, Ill., engrs.)

**Virginia**—State Hy. Dpt., Richmond, six 50 ft. spans steel beam, concrete deck girder bridge, three 105 ft. low steel trusses over James River, Botetourt Co., to Blount & Hayman, Brodnax, $46,261. Noted Nov. 6.

**B. C., Vancouver**—City Council, 2,817 ft. steel, concrete bridge over False Creek, Burrard St., to Hodgson, King & Marble, 626 Render St. W., and Dawson, Wade & Co., 500 Beatty St., $1,739,547. Est. $2,800,000. Noted Aug. 28.

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## STREETS AND ROADS

### BIDS ASKED

**Alabama**—Dec. 17, by State Hy. Dpt., Montgomery, concrete paving 27 mi. Mobile Co., 18 ft. $440,000.

**Ala., Mobile**—Dec. 9, by Bd. City Comrs., granite curbing, concrete curbing, concrete guttering, alternate types paving Groups, 1, 2, 3, 4, 5, and 6 also 12,981 ft. 6, 10, 12, 15, 18, 21 and 24 in. storm sewers, 34 manholes, 79 inlets, 25 special basins. W. Smith, city engr.; adv. E. N.-R. Nov. 27.

**Calif., Los Angeles**—Dec. 8, by M. Beatty, clk. Los Angeles Co., grading, curbing, guttering, sidewalks, 9-7-7-9 in. compressed concrete paving 175,000 sq.ft. A and I., 283 Sawtelle Blvd., to exceed $80,000; grading, sewers, 2 in. bituminous paving 106,500 sq.ft. Co. Impvt., 950 Banning Blvd., et al., to exceed $30,000.

**Calif., Oakland** — Dec. 4, by F. C. Merritt, city clk., grading, curbing, sidewalks, 7 in. concrete paving 270,500 sq.ft. Hopkins St. from College Ave. to High St. $100,000 or more. W. N. Frickstad, city engr.

**Colorado**—Dec. 3, by State Hy. Dpt., Denver, grading, oil processed gravel surfacing 15.967 mi. Cheyenne Wells Rd., State Hy. 8, Combined Federal Aid Project 278-A, Div. 1 and 278-C Cheyenne Co.—grading, gravel surfacing 1.93 mi. Durango-Bayfield Rd., State Hy. 10, Federal Aid Project 265-D La Plata Co.—4.63 mi. Maybelle-Craig Rd., State Hy. 2, Federal Aid Project 150-B, Moffat Co. J. E. Maloney, acting state hy. engr.

**Idaho** — Dec. 9, by J. D. Wood, comr. P. Wks., Boise, grading, crushed graveling 5.77 mi. Idaho Montana Hy. from Spencer south, Clark Co.

**Ind., Columbia City**—Dec. 4, by Bd. Comrs. Whitley Co., gravel surfacing 29,821 ft. Smith and Watson Rds., $47,407; 15,136 ft. Gross Rd., $16,385. R. F. Raber, Columbia City, engr.

**Ind., Crown Point**—Dec. 2, by Comrs. Lake Co., graveling Frank DeLau Rd., Ross Twp. $25,000. W. E. Whitaker, Crown Point, aud.

**Ind., Terre Haute**—Dec. 8, by Bd. Comrs. Vigo Co., grading, drainage structures, pre-coated bituminous macadam on dust filled gravel paving 4.721 Raymond B. Kintz et al. Hy., Harrison Twp., $70,769. C. C. Pinson, co. aud.

**Kansas**—Dec. 5, by State Hy. Comn., Topeka, at Court House, Clay Center, grading, bridge approaches P. 15-19, F.A.P. 377—sand gravel or chats surfacing 16.85 mi. P. 15-19, F.A.P. K-1132, both Clay Co.—7 mi. P. 28-1, F.A.P. K-1130, Cloud Co.—14 mi. P. 28-2, F.A.P. K-1129, Jewell Co.—1.75 mi. P. 18-10, F.A.P. K-1131, Lincoln Co. W. V Buck, hy. engr.

**Kentucky**—Dec. 9, by State Hy. Dpt., Frankfort, grading 5.6 mi. Greensburg-Hardyville Rd., State Aid Project 16-AG, Green Co.; 3.1 mi. Carlisle-Flemingsburg Rd., State Aid Project 43-BG, Nicholas Co. B. Johnson, chm.

**Massachusetts**—Dec. 2, by Dpt. P. Wks., State House, Boston, rein.-con. paving 9.060 ft. and bituminous macadam paving 5.090 ft. Sheffield—bitulithic concrete paving 29,800 ft. Barnstable—15,567 ft. Bourne and Plymouth—widening, rein.-con. resurfacing 8,488 ft. and bitulithic concrete on concrete paving 9,600 ft. Wilbraham—widening, rein.-con. paving 13,460 ft. hy. and widening concrete, stone arch bridge Monson and Palmer—bituminous macadam paving 9,248 ft. Wareham. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

**Michigan**—Dec. 3, by E. H. Haahr, resident engr., Newberry, grading, shaping, drainage, concrete paving 2.49 mi. MO48-9 Contr. 2, Luce Co., 20 ft., for State Hy. Comn., Lansing.

**Michigan**—Dec. 3, by R. W. Roberts, resident engr. Saginaw, grading, shaping, drainage, 2 course gravel surfacing 12.637 mi. MO9-19C-1 and MO26-15C-1, 18 ft., for State Hy. Comn., Lansing.

**Missouri**—Dec. 2, by State Hy. Dpt., Jefferson City, stone surfacing Cooper Co.—grading, concrete paving Gasconade, Lincoln and St. Louis Counties — graveling Audrain, Dallas, Dent, Douglas, Dunklin, Iron, Knox, Davis, Lincoln, McDonald, Pike, Putnam, Stone, Sullivan, Cedar, Washington and Taney Counties—grading Adair, Clark, Henry, Johnson, Lafayette, Mercer, St. Louis, Scotland, Shannon, Texas and Wright Counties. T. H. Cutler, ch. engr.

**N. Y., Brooklyn**—Dec. 3, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, curbing, flagging, asphalt on 6 in. paving Avenues L and U, Battery, Georgia, Livonia, 11th Aves., Boerum, Heyward, West 4th, 62nd and 64th Sts.; grading 16th Ave., East 7th and Ford Sts.

**N. Y., Buffalo**—Dec. 4, by G. Fisk, comr. P. Wks., Municipal Bldg., repaving Arlington Park, Jersey, South, and Tonawanda Sts., paving Garden Alley. W. Rathman, city engr.

**N. Y., New York**—Dec. 2, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks on West 232nd St., Matthews, Goulden, Library and Kearney Aves.; sewers in Waring and Woodhull Aves.

**N. Y., New York**—Dec. 3, by J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, widening, sheet asphalt repaving West 66th St. and Madison Ave.

**N. Y., New York**—Dec. 5, by J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, granite block on concrete paving Marginal St., wharf or place from point 117 ft. south of north curb line of Morris St., etc.

**N. Y., St. George**—Dec. 3, by J. A. Lynch, pres. Richmond Boro, Boro Hall, cinders and broken stone on roadway on 3rd St. and Gun Factory Rd.—grading, sidewalks on Alter Ave.—grading Woolley Ave.

**North Carolina**—Dec. 9, by State Hy. Comn., Raleigh **(P. means Project)**, grading, draining, concrete or asphaltic paving 11.75 mi. P. 3322, Columbus Co., $158,000 — 4.58 mi. P. 4820, Wake Co., $65,400 — 9.88 mi. P. 3512, New Hanover Co., $131,400 — 4.89 mi. P. 7717, Watauga Co., $100,800—2.77 mi. P. 8460, McDowell Co., $57,300—4.1 mi. P. 8450, McDowell Co., $81,600—5.59 mi. P. 1572, Martin Co., $95,800—clearing, grading, draining 13.64 mi. P. 1920 Tyrrell Co., $87,700—7.49 mi. P. 2161, Craven Co., $32,100—7.41 mi. P. 6340, Gaston Co., $35,600—grading, draining, topsoiling 7.42 mi. P. 3072, Bladen Co., $50,900—8.79 mi. P. 6693 Rowan Co., $44,800—3.95 mi. P. 5660, Moore Co., $25,000. J. D Waldrop, Raleigh, engr.

**O., Akron**—Dec. 8, by Comrs. Summit Co., grading, curbing, 3 in. vitr. brick paving 2,375 sq.yd., sheet asphalt paving 400 sq.yd., waterbound macadam paving 1,200 sq.yd. Akron-Cuyahoga Falls Rd.-SH 92, Sect. K, 40 and 60 ft. $37,000. H. G. Sours, Court House, engr.

**Pa., Phila.**—Dec. 9, by Bureau Hys., Dpt. P. Wks., A. Murdock, dir., City Hall Annex, Schedule A, improving (grading and sewer assessment work), Olney Ave. from Philadelphia, Newton & New York R.R. to Rising Sun Ave.—Schedule B, improving and paving (assessment work) Olney Ave. from Front St. to Rising Sun Ave.—Schedule C, asphalt paving (assessment work) Briar St. from 75th Ave. to Washington Lane, East Clapier St. from Baynton St. west to end, High and Mechanic Sts. from Mansfield to Stenton Sts., Juniper St. from Bigler to Pollock Sts. and Washington Lane from Mansfield to Stenton Sts.—Schedule D, asphalt repaving Belgrade St. from Norris to York Sts. and Clearfield St. from Kensington to E Sts.—Schedule E, furnishing, laying water pipe in Olney St. from Front St. to Rising Sun Ave. (assessment work), incl. 3.4 tons 8 in., 77.3 tons 12 in., 26 tons 6 in. c.i. pipe, 4 tons c.i. specials, two 8 in., five 12 in. and four 6 in. valves—Schedule F, redressed granite block repaving Noble St. from New Market to 3rd Sts., 4th and 5th Sts. from Market to Walnut Sts.—Schedule G, furnishing, delivering 1,000 bbl. high early strength portland cement — Schedule H, hire of motor trucks and teams—Schedule I, furnishing, delivering 1,000 tons binder stone and asphalt sand.

**South Carolina**—Dec. 2, by State Hy. Dpt., Columbia, topsoiling approaches to bridge 2.9 mi. hy. in Saluda and Newberry Counties—topsoiling and sand clay surfacing 18.7 mi. Chesterfield Co.—topsoiling in preparation for surface treatment 18 mi. Kershaw Co.—7.4 mi. hy. Newberry Co. — 4.3 mi. Lancaster and Chester Counties—sand clay surfacing in preparation for surface treatment 13.4 mi. Clarendon and Williamsburg Counties—clay bound macadam surfacing 4.42 mi. Oconee Co.—surface treating 5.6 mi. Colleton Co.—grading 11.5 mi. Chesterfield Co.—21.1 mi. Spartanburg and Greenville Counties.

**Texas** — Dec. 1, by G. Gilchrist, state h engr., Austin **(F.A.P. means Federal Aid Proje and S.A.P. State Aid Project)**, grading draina structures 16.408 mi. Hy. 75, F.A.P. 547-1 Unit 1, Wheeler Co., $72,000—14.702 mi. H 23, F.A.P. 600-B and C, Unit 1, Runnels an Coleman Counties—12.855 mi. Hy. 20-A, S.A.P 908-B, Unit 1, Gillespie Co., $48,600—11.30 mi. Hy. 34, S.A.P. 859-H, Unit 1, Jack Co $90,000, all foregoing 26 ft. wide—double bituminous on 3½ in. compacted gravel and limestone surface course on 6½ in. compacted grav base course surfacing 9.757 mi. Hy. 72, F.A.P 574, Unit 2, Fayette Co., 18 ft., $117,000—rein.-con. bridges on Hy. 23, F.A.P. 600 B an C, Runnels and Coleman Counties.

**Texas** — Dec. 1, by G. Gilchrist, state hy engr., Austin, **(F.A.P. means Federal Aid Proje and S.A.P. State Aid Project)**, grading, draina structures 4.237 mi. Hy. 145, S.A.P. 931-A Unit 1, Live Oak Co., $25,200—8.5 mi. Stat Hy. 36, S.A.P. 889-D, Unit 1, Brazoria Co $68,400—7.348 mi. State Hy. 15, F.A.P. 363-D Unit 1, Van Zandt Co., $80,000—17.7 mi. Stat Hy. 7, F.A.P. 503-A, Unit 1, Lubbock Co., $46 800—9.418 mi. State Hy. 2, F.A.P. 130-B, Uni 1, McLennan Co., $54,000, all foregoing 26 ft wide—bituminous on crushed stone surfacin 9.77 mi. State Hy. 9, F.A.P. 412-B, Unit 2 18 ft., Tom Green Co., $95,000.

**Texas** — Dec. 1, by G. Gilchrist, state hy engr., Austin, grading, drainage structure 7.963 mi. State Hy. 40, Federal Aid Project 556-G, Unit 1, Henderson Co., $80,000; 10.4 mi. Hy. 11, State Aid Project 922-C and E Unit 1, Morris and Bowie Counties, $100,000 both 26 ft.

**Tex., Amarillo**—Taking bids concrete curbing, guttering, alternate types paving 5 blocks portions of East 10th, Ong, and 26th Sts., 30 40 ft. $30,000. E. N. Stanley, c/o City Hall engr.

**Tex., San Angelo**—Taking bids 1 in. asphalt on 8 in. sledged stone paving 6 blocks, 36 ft $35,000. French & French, San Angelo, engrs.

**Virginia**—Dec. 9, by State Hy. Dpt., Richmond, grading, macadam paving 1.3 mi. roads in Wythe Co.; grading 5.7 mi. Accomac Co.; adv. E. N.-R. Nov. 27.

**Wash., Pacific City**—Jan. 1, by City Comrs., 73,000 ft. concrete sidewalks in main business district. J. A. Fallgreen, Auburn, city engr.

**Ont., Kitchener**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Alabama** — State Hy. Comn., Montgomery, grading, draining 26½ mi. Birmingham-Harpersville Rd., Jefferson Co., to State Convict Department, Montgomery, $501,000; small concrete bridges on same road, to H. N. Donahoo, 510 North 21st St., Birmingham, $100,000.

**Arizona** — State Hy. Comn., Phoenix, oil processing and 2 bridges on Phoenix-Yuma Rd., F.A.P. 56-Reopened, Units A and B, to Skeels & Graham Co., 709 Consolidated Bank Bldg., Tucson, $61,770. Noted Oct. 30.

**California**—C. H.: Purcell, ch. engr. State Hy. Comn., Sacramento, oil surfacing 2.5 mi. roads in Los Angeles Co., to C. A. Ladeveze, South Gate, $5,635; grading, concrete surfacing 0.2 mi. Kern Co., 20 ft., to Valley Paving & Constr. Co., Visalia, $22,820.

**Calif., Inglewood**—City Council, grading, guttering, curbing, Durite asphaltic concrete paving Van Ness Ave., to Curtis Paving Co., 2440 East 26th St., $31,235. Noted Oct. 23.

**Calif., Los Angeles**—Los Angeles Co., grading, concrete paving La Brea Ave. from Slauson Ave. to Fairview Blvd. to Kovacevich & Price, Inc., 5400 Imperial Hy., South Gate, $25,360. Noted Oct. 16.

**Calif., Los Angeles**—Bd. P. Wks., grading, curbing, sidewalks, 6 in. concrete paving 68th Street and Denker Avenue Impvt. Dist., to J. A Thompson, Financial Center Bldg., $94,270; curbing, sidewalks, 6 in. National asphaltic concrete paving Westwood Blvd. from Santa Monica to Pico Blvds., to Curtis Paving Co., 2440 East 26th St., $44,610.

**Colorado**—State Hy. Comn., Denver, gravel surfacing 6.663 mi. Grand Co., to J. H. Miller & Co., Denver, $76,910—9.834 mi. Eagle Co., to Utah Constr. Co., Ogden, Utah, $159,143—oil processed gravel surfacing, Kit Carson Co., to H. C. Lallier Constr. Co., 1657 Lallier St., $111,217. Grand total $347,270. Noted Oct. 30 and Nov. 6.

**Florida**—State Roads Dpt., Tallahassee, concrete paving Hy. 17, Polk Co., to John J. Quinn Co., Inc., Miami, $263,164—surface treating Road 47, St. Johns Co., to L. M. Gray, Gainesville, $70,150—Road 3, Duval Co., to R. G. Lassiter Co., Jacksonville, $100,536—macadam asphalt paving, 4.72 mi. Road 4, Project 883, Duval Co., to H. E. Wolfe Constr. Co., St. Augustine, $101,440—constructing bridge over Crane Creek, Road 4, Brevard Co., to Okeechobee Constr. Co., Okeechobee, $67,704—prime cost for Road 54, Okaloosa Co., to American Tar Products Co., Birmingham, Ala., $2,134—oil surfacing contract for same road, to Pan American Petroleum Co., Rhodes-Haverty Bldg., Atlanta, Ga., $1,436—gravel and cover same project, to Roquemore Gravel Co., Montgomery, Ala., $3,577 — untreated piling contract Projects 912 and 913, Road 85, Martin and Okeechobee Counties, to Carolina Wood Preserving Co., Charleston, S. C., $875 — lumber on same projects, to Postell Lumber Co., Gainesville, $1,133. Grand total $612,149. Noted Oct 30 and Nov. 6.

**Georgia**—B. P. McWorther engr., 325 State Capitol, East Point, hard-surfacing 11.5 mi. road between Perry and Ft. Valley, Peach and Houston Counties, to Georgia Lime Rock Co., Healey Bldg., Atlanta, $150,000. Noted Nov. 13.

**Streets and Roads (Continued)**

**Ill., Carlinsville**—Macoupin Co., concrete paving ½ mi. east from Staunton to Route 16, to Haynes & Kilgo, Jerseyville, $11,749; grading, culverts, bridges Route 13, Sect. 1-A from Modesto to Scottville, to H. P. Pipp, Mount Carmel, $24,519.

**Ill., Chicago**—See "Bridges."

**Ill., Chicago**—Bd. Comrs. Cook Co., County Bldg., to Arcole Constr. Co., Evanston, grading, paving 11,198 sq.yd. Crawford Ave. from 63rd Pl. to 71st St. $19,327; 20,117 sq.yd. Crawford Ave. from 73rd to 87th Sts. $36,630; 19,540 sq.yd. Cicero Ave. from Elston to Devon Aves. $40,190; 12,753 sq.yd. Devon Ave. from Legett Ave. to McCormick Blvd. $21,302; 6,868 sq.yd. Devon Ave. from Canfield Rd. to Avondale Ave., $11,455; 11,631 sq.yd. Crawford Ave. from Bryn Mawr to Devon Aves. $19,218; 13,933 sq.yd. Crawford Ave. from 87th to 95th Sts. $25,034; 9,973 sq.yd. 127th St. from Vincennes Ave. to Aberdeen St. $15,352; 17,313 sq.yd. 127th St. from Aberdeen St. to Indiana Ave. $32,194; 35,689 sq.yd. Burnham Ave. from 183rd St. to Glenwood-Dyer Rd., $69,602; 4,233 sq.yd. Traffic Circle, $14,182; 26,442 sq.yd. Nagle Ave. from Irving Park Blvd. to North West Hy. $40,899. Grand total $345,485. Noted Oct. 9.

**Indiana**—State Hy. Comn., Indianapolis, concrete surfacing 5.434 mi. Project 193-F, 40 ft., Laporte Co., to Scharl Constr. Co., Grand Rapids, Mich., $258,993.

**Ind., Bedford** — Lawrence Co., gravel surfacing Gilgal Rd. 5, to Norman & Norman, Bedford, $8,221; Holmes Rd. 7 and Meadows Rd. 6, to Bynum & Musselman, New Berry, $35,660. Noted Oct. 23.

**Iowa**—State Hy. Comn., Ames, to Dobson & Robinson, Lincoln, Neb., grading, flumes, paving 1.954 mi. roads in Appanoose Co. $54,040; 10.897 mi. F-209 A and B $310,334; 3.978 mi. F-153 A $108,134, both Davis Co.—to Larson-Erling Co., Sioux Falls, S. D., 11.383 mi. Hardin Co. $289,594—to Star Coal & Impvt. Co., Davenport, 0.148 mi. Linn Co. $5,403—to Booth & Olson, Inc., Grain Exch. Bldg., Sioux City, 12.333 mi. Guthrie Co. $287,755; 3.653 mi. Dallas Co. $137,633—to Halvorson Bros., Spring Grove, Minn., crushed stone graveling 11.57 mi. Allamakee Co. $21,108—to C. B. Thompson, Shell Rock, Class A gravel surfacing 4.034 mi. Butler Co. $5,103. Grand total $1,219,094. Noted Nov. 6.

**Kansas**—State Hy. Comn., Topeka, at Court House, Ottawa, grading, culverts 6.016 mi. roads in Haskell Co., to A. L. Cook, Ottawa, $35,699—9.092 mi. Gray Co. and 18.27 mi. Ford Co., to J. J. Thomson, 5641 Jones St., Omaha, Neb., $47,084 and $48,675 respectively—concrete surfacing 6 mi. Ford Co., to Whitney Teeter Constr. Co., Hutchinson, $115,156. Grand total $246,614.

**Louisiana** — State Hy. Comn., Baton Rouge, grading, gravel surfacing 4.3 mi. Alto-Columbia Hy., Richland Parish, to W. O. McKeithen, Grayson $22,858; grading, surfacing 3 mi. Spearville-Farmerville Hy., Union Parish, to Britt & DeLaughter, Boughton, Ark., $16,992. Noted Oct. 9.

**La., New Orleans**—City Council, to Craven & Lang, New Orleans Bank Bldg., concrete paving 4,190 sq.yd. Villette St. from Newton to Socrates Sts. $21,710; warrenite bitulithic on concrete paving Desire St. from Tont St. to Florida Ave. $21,430; bitulithic wearing surface on bituminous concrete paving 1,360 sq.yd. Desota St. from Broad Ave. to Bayou Rd. $7,730 — to Southern Uvalde, Rock Asphalt Co., New Orleans Bank Bldg., concrete curbing, Uvalde rock asphalt on 6 in. concrete paving 4,990 sq.yd. Spain St. $25,430—to Globe Constr. Co., Inc., Louisiana Bldg., concrete paving, sidewalks on Villette St. $3,180—to M. J. Flynn, New Orleans, concrete paving, drives and sidewalks South Roman St. $9,110; Spain St. $7,390; Thalia St. $11,150—to H. P. and J. F. Egan, New Orleans, sub-surface drainage system on Villette St. $8,990. Grand total $116,120.

**La., New Orleans** — City Council, to M. J. Flynn, New Orleans, concrete paving South Derbigny St. $7,910; Laharpe St. $11,460; Desire St. from Marias to Tonti Sts. $8,830; Desire St. from Tonti St. to Florida Ave. $3,610; concrete footwalks on Tolouse St. $9,970—to Craven & Lang, New Orleans Bank Bldg., concrete curbing, warrenite bitulithic wearing surface on 6 in. concrete paving 8,890 sq.yd. Thalia St. $47,240; 4,160 sq.yd. North Derbigny St. $22,570—to B. C. Grasser & Co., Maritime Bldg., concrete sidewalks on North Derbigny St. $4,950—to H. P. and J. F. Egan, New Orleans, sub-surface drainage system Tolouse St. $19,490; sub-surface drainage system, manholes, handholes, cleanouts North Derbigny St. $4,830; South Derbigny St. $5,150; DeSota St. $1,470; Burdette St. $14,150. Grand total $161,630.

**Michigan** — C. L. Cowgill, resident engr., Plymouth, grading, draining, concrete paving 10.003 mi. FO63-30-C-1, 40 ft., and 4.284 mi. MO63-30C-2, Oakland Co., 20 ft., to J. A. Mercier, 452 West Fort St., Detroit, for State Hy. Comn., Lansing, $619,066 and $162,110 respectively, incl. cement. Noted Oct. 23.

**Michigan**—At office Village Clerk, Vassar, grading, shaping, drainage, concrete paving 3.428 mi. FO79-34C-1 and 1.267 mi. MO79-34C-2, both Tuscola Co., 20 ft., to C. A. Handeyside Constr Co., 12-233 General Motors Bldg., Detroit, for State Hy. Comn., Lansing, $81,272 and $31,181 respectively, incl. cement. Noted Oct. 23.

**Montana**—State Hy. Comn., Helena, graveling 8.978 mi. Lewistown-Grass Range Rd., Fergus Co. and 18.776 mi. Shelby-Cut Back Rd., Toole and Glacier Counties, to Goble Constr. Co., Rapid City, S. D., $22,164 and $67,417 respectively—9.163 mi. Grass Range-Jordan Rd., Fergus Co., to Basin Constr. Co., Lewistown, $18,309—grading 15.337 mi. Miles City-Broadus Rd., Custer Co. to Prahl & Sawtell, Miles City, $59,927—10.884 mi. Belton-Kalispell Rd., Flathead Co., to J. Crick, Realty Bldg., Spokane, Wash., $77,157—9.116 mi. Stryker-Roosville Rd., Lincoln Co., to Sutherland & Burns Constr. Co., Missoula, $91,501—bridge on Miles City-Broadus Rd., Custer Co., to L. V. Lockwood, Glasgow, $28,238—redecking Powder River Bridge, Prairie Co., to Mackin & Berg, Brockway, $3,074. Grand total $367,787. Noted Nov. 6.

**Nebraska** — Dpt. P. Wks., Lincoln, to R. Knight, Lincoln, grading 7.3 mi. Ord-Arcadia Rd., Valley Co., $10,222—to Diamond Eng. Co., Grand Island, culverts on same road $4,194; driveway pipe $278, bridge $3,930; graveling 12.3 mi. St. Paul-Loup City and St. Paul-Elba Rds., Howard and Sherman Counties, $4,167—to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, graveling 7.7 mi. St. Paul-North Loup Rd., Howard and Greeley Counties, $12,179; 6.5 mi. Elba-Cotefield Rd., Howard Co., $9,756. Grand total $44,726. Noted Oct. 23.

**N. J., Ocean Grove** — Ocean Grove Camp Meeting Assn., concrete paving ¾ mi. Ocean Ave., 29 ft., to E. T. McNierney, Bradley Beach, $28,254.

**N. J., Teaneck**—Township Comn., Municipal Bldg., grading, concrete paving Martense Ave., Beverly Rd. and Merrison St., to F. Toriello, 2nd St., Hackensack, $29,081. Noted Oct. 13 Daily.

**New York** — Westchester Co., C. MacDonald, engr., Court House, White Plains, curbing, sidewalks, paving Greeley and Washington Aves., Mount Pleasant and New Castle, to A. W. Banko, Valhalla. Noted Oct. 30.

**N. Y., New York**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading Radcliffe Ave., to S. La Barbera, $7,552—Cannon Pl., to S. Nugent, Riverdale Ave., $12,724—West 236th St., to C. D. Beckwith, Seneca Ave. and Edgewater Rd., $675—Barnes Ave., to P. Mascali, 454 Tremont Ave., $1,237—Story Ave., to Courtland Foundation Co., 3157 Park Ave., $26,571—East 213th St. and sewer in Grace Ave., to C. Turiano Contg. Co., 2913 Coddington Ave., $6,039 and $7,964 respectively. Grand total $62,762. Noted Nov. 6.

**N. Y., New York**—A. Goldman, comr. Plant & Structures, Municipal Bldg., grading, repaving East 58th St., to Meehan Paving Co., 90 West St., $30,503. Noted Nov. 6.

**O., Akron**—F. E. Swineford, dir. Pub. Serv., grading, constructing sewers preliminary to paving and improving 1½ mi. Tallmadge Ave. to connect North Hill Sect. with West Hill Sect. and Uhler Ave. from Cuyahoga St., to West Tallmadge Ave., to Shullo Constr. Co., 1200 Home Ave., $123,964. Est. $177,769. Noted Oct. 30.

**South Dakota**—State Hy. Comn., Pierre, grading 9.988 mi. Castlewood-Clearlake Rd., Deuel Co., and 26.826 mi. McIntosh-McLaughlin Rds., Corson Co., to Dowd Bros., Clark, $35,046 and $66,943 respectively—13.749 mi. Lake Preston Rd., Kingsbury and Brookings Counties, to T. J. Tobin, Sioux Falls, $45,378—15.224 mi. Dallas-Burke Rd., Gregory Co. and graveling 17.091 mi. Faith-Phillip Rd., Haakon Co., to Larson Erling Co., Sioux Falls, $33,491 and $26,089 respectively—16.673 mi. U. S. Hy. 18, Todd Co., to Summit Constr. Co., Summit, $45,968. Grand total $252,915. Noted Oct. 23.

**South Dakota**—State Hy. Comn., Pierre, grading 9.027 mi. Lincoln Co., to T. J. Tobin Constr. Co., Sioux Falls, $19,162—3.996 mi. Dewey Co., to Sofus Brams, Dupress, $7,801—9.6675 mi. Washabaugh Co. to G. W. England & Son, Murdo, $41,406—5.983 mi. Day Co., to A. F. Jarvis, Sioux Falls, $15,263—graveling 8.5 mi. Hamlin Co., to Larson-Erling Co., Sioux Falls, $4,887—7.812 mi. Brown Co., to H. Pickus Constr. Co., Aberdeen, $8,000—11.269 mi. Butte Co., to Northwestern Eng. Co., Rapid City, $15,657—5.928 mi. Haakon and Ziebach Counties, to Summit Constr. Co., Summit, $6,170—bridges, Kingsbury Co., to Dowd Bros., Clark, $3,813—F.A.P. 180 F and G, Corson Co., to L. J. Dunn, Clear Lake, $16,763 — 6.609 mi. Lincoln Co. to W. A. Barnhart Constr. Co., Salem, $6,609. Grand total $145,531. Noted Oct. 23.

**Washington**—S. J. Humes, dir. Hys., Olympia, grading 0.9 mi. Skamania Co., to Colonial Building Co., 617 Hutton Blvd., Spokane, $48,611—7.465 mi. Benton and Yakima Counties, to J. Slotte & Co., Inc., Astoria, Ore., $66,392—1.468 mi. Pend Oreille Co., to C. Nyberg, 507 Realty Bldg., Spokane, $38,748 — 2.113 mi. Grant Co., to S. Orino, 508 Realty Bldg., Spokane, $34,110. Grand total $187,861. Noted Oct. 23.

**Wash., Seattle**—Bd. P. Wks., paving 4th Ave. S., to Moceri Bros., 2025 Jackson St., $33,476; Rosemont Pl., to J. B. Covello, 1510 Sturges St., $57,498. Noted Sept. 25.

**Wis., Milwaukee**—Dpt. P. Wks., paving East Keefe Ave., to A. J. Koch, 1297 Cramer St., $8,849—North 42nd St., to J. C. Bluhm & Son, 1299 Achilles Ave., $17,546—North 72nd St., to Schwerm Bros., 1703 Weil St., $1,331—South Superior St., to N. Harris, 244 Mason St., $550—West Loraine Pl., to A. E. Retzlaff, 868 Island Ave., $6,288. Grand total $34,564.

**Ont., Kitchener**—Concrete paving East Weber St., sewer extensions in Schneider and Wendell Aves., day labor, $63,000. S. Shupe, city engr.

## EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

### PROPOSED WORK

**Kansas** — Delaware D. D. 2, Atchison Co. (Atchison) and Jackson Co. (Holton) preliminary plans 10 mi. flood control work along Grasshopper Extension of Delaware River. E. T. Archer, 609 New England Bldg., Kansas City, Mo., engrs.

**La., New Orleans**—Orleans Levee Bd., concrete seawall extension into new basin canal and Bayou St. John to locks and and on Orleans Canal and London Ave., 700 ft. into canals, $215,000; improving London Avenue outfall canal levees, $500,000.

**La., New Orleans**—Orleans Levee Bd., Orleans Parish, improving levees along Orleans Outfall Canal, both sides, $380,000; improving 4,900 ft. Dumaine Street Levee from Bienville St. to Esplanade Ave. on Mississippi River, $195,000.

**Mississippi**—Bd. Comrs. Bear Creek Drainage Dist., Belzoni, Humphreys, Sunflower and Leflore Counties, retained C. E. Miller, engr., Belzoni, to prepare plans 9,000,000 cu.yd. ditches, 1,000,000 cu.yd. levees. C. E. Miller, Belzoni, engr.

**N. J., Long Branch**—Bd. City Comrs., City Hall, preliminary plans steel, stone jetty, foot Pavilion Ave. $25,000. O. R. Seaman, city engr.

**Okla., El Reno**—Bd. Comrs. Banner D. D. 6, Canadian Co., excavating 119,235 cu.yd. H. Powell, El Reno, engr.

**Ont., Kincardine**—Council, W. J. Morrison, mayor, chm. com., breakwater to prevent embankment from erosion by Penetangore River, constructing new road at beach and widening Russell St. $30,000. **Engineer not selected.**

**Ont., Pelee Island**—Council, protection along lake shore to prevent land submersion during storms. $25,000. O. Rolfson, engr., c/o W. Stewart, clk., Town Hall, engr.

### BIDS ASKED

**Ariz., Phoenix** — Majestic Groves, Inc., Phoenix, taking bids 16,500 lin.ft. 12 and 15 in. cement pipe for distribution system to irrigate 160 acres. J. Girand, Phoenix, engr.

**California**—LEVEE—Dec. 8, by U. S. Eng., California Fruit Bldg., Sacramento, raising levee along south section Yolanda Sta., on Sacramento Northern R.R., 380,000 cu.yd.

**Illinois**—Nov. 28, by Bd. Comrs. Union D. D. 1, South Homer Twp., Champaign Co., and Sidell Twp., Vermilion Co., at Fairland School, Route 49, 3 mi. south of Homer, excavating 11,652 ft. open ditch 17,018 cu.yd. excav. Fisher & McCann, Danville, engrs.

**Ia., Kosciusko**—Dec. 6, by Bd. Comrs. Van Buren Co., clearing right-of-way, repairing extending Fox River D. D. 1, incl. 119,619 cu.yd. excav. C. E. Armstrong, co. aud.

**N. J., Brigantine** — Dec. 10, by Bd. Freeholders Atlantic Co., Guarantee Trust Bldg., Atlantic City, 96,000 ft. timber bulkhead at Brigantine Bridge. $25,000. A. H. Nelson, 741 Guarantee Trust Bldg., Atlantic City, engr. Noted Nov. 20.

**N. Y., Long Island City** — Dec. 2, by G. U. Harvey, pres. Queens Boro, Queen Subway Bldg., widening, deepening existing drainage ditches from culvert under Kissena Blvd., to Flushing River, Queens Boro. Code NPQ-56.

**Okla., Pauls Valley**—Bd. Comrs. Wold Horse D. D. 2, bids about Jan. 1. 465 stations open ditch work, incl. 320,474 cu.yd. excav. $64,910. A. Rennie, Pauls Valley, atty.

### CONTRACTS AWARDED

**Indiana** — Bd. Comrs. Cass Co., Logansport, M. P. Hill Ditch in Cass and White Counties, to E. M. Melahan Contg. Co., Algonquin, Ill., $30,000.

**Ind., Ft. Wayne**—Allen Co., 8 mi. Martin Johnson Ditch, to C. Duglay, Churubusco, $19,013. Est. $25,000.

**Va., Cape Charles**—See "Unclassified."

## *Public Bond Elections*

### *Coming Bond Elections*

**Waterworks and Sewers**—Gilman City, Mo., Nov. 25, $65,000.
**Waterworks**—Okanche, Okla., Nov. 25, $50,000.
**Waterworks**—Perry, Okla., Nov. 25, $249,000.
**Waterworks**—Tenaha, Tex., Dec. 5, $35,000.
**Sewers**—Hagerstown, Md., $250,000.
**Sewer System** — Blanchard, Okla., Nov. 26, $40,000.
**Parks, Playgrounds, Street Impvt.**—San Francisco, Calif., City and County, January, $2,500,000.
**School**—Pocatello, Idaho, $450,000.
**Court House**—Fresno County, Calif., $500,000.

### *Bonds Voted*

**Waterworks**—Mobile, Ala., $200,000.
**Waterworks**—Colchester, Ill., $70,000.
**Water Softening and Filtration Plant** — Neodesha, Kan., Black & Veatch, Kansas City, Mo., Engrs., $65,000.

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Public Bond Elections (Continued)

**Waterworks Impvts.**—Minot, N. D., $75,000.
**Sewers**—Mobile, Ala., $250,000.
**Bridge, Hawthorne St. (rebuilding)** — Portland, Ore., Multnomah County, $150,000.
**Airport Impvts.**—Mobile, Ala., $75,000.
**Harbor Impvts.**—Portland, Ore., $1,500,000.
**Swimming Pool**—Boone, Iowa, $25,000.
**School**—Brentwood, Pa., $750,000.

## *Bonds Defeated*

**Waterworks**—Desoto, Kan., $30,000.
**Sewers**—McKeesport, Pa., $660,000.
**Bridges** — Omaha, Neb., Douglas **County.** $2,600,000.

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## FEDERAL GOVERNMENT

### PROPOSED WORK

**Idaho, Challis**—BRIDGE—Pub. Rds., Ogden, Utah, steel, concrete bridge over Salmon River, on Lost River Hy., southeast of here. B. J. Finch, Ogden, dist. engr.

**Ill., Cairo**—TOWBOATS, etc.—Inland Waterways Corp., Munitions Bldg., St. Louis, Mo., soon takes bids three 1,200 hp. standard towboats; 1 Diesel twin screw towboat, 20 open and 30 closed type standard barges, 1 track barge.

**Ill., Dresden**—LOCK and DAM—U. S. Eng., Chicago, lock and dam.

**Ind., South Bend** — POST OFFICE — Treas. Dpt. at office Superv. Archt., post office, Jefferson and Main Sts. $750,000.

**Me., Sanford**—POST OFFICE—Treas. Dpt. at office Sup. archt., post office, Mousan and School Sts. J. A. Wetmore, c/o owners, archt.

**Md., Fort Hoyle** — QUARTERS, etc. — Con. Q. M. 3 sets officers quarters, concrete sidewalk.

**Mo., Kansas City**—REVETMENT—U. S. Eng., 6,600 lin.ft. revetment at Mile 409.7.

**Nev., Hawthorne**—RESERVOIR, etc.—Yards & Docks, Navy Dpt., reservoir and mine filling plant, at Naval Ammunition Depot.

**O., Columbus**—WELL—Con. Q. M. 10 in. water well, pumping equipment, Columbus General Depot.

**Pa., Clearfield**—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, stone, 2nd and Pine Sts.

**R. I., West Warwick** — POST OFFICE — Treas. Dpt. at office Sup. Archt., post office, Main and Charles Sts.

**Tex., Fort Worth**—POST OFFICE—Treas. Dpt. at office Superv. Archt., plans by W. C. Hedrick, Inc., Fort Worth. U. S. Post Office, 105,000 sq.ft. floor space. Noted Mar. 15, 1928.

**Tex., Wichita Falls**—POST OFFICE—Treas. Dpt. at office Sup. Archt., selected site 125 x 350 ft. post office, Lamar St. between 10th and 11th Sts. Noted Sept. 11.

**Wis., Milwaukee** — BREAKWATER — U. S. Eng., rebuilding 758 lin.ft. south breakwater.

**Wis., Sparta**—OFFICE—Con. Q. M. office building at Camp McCoy.

### BIDS ASKED

**Ala., Montgomery**—HANGARS—Dec. 18, at office Con. Q. M., Maxwell Field, 4 standard airplane hangars at Maxwell Field; adv. E. N.-R. Nov. 27. Noted Sept. 4.

**Ala., Montgomery**—QUARTERS—Dec. 17, at office Con. Q. M., Maxwell Field, 9 double sets non-commissioned officers quarters, Maxwell Field; adv. E. N.-R. Nov. 27.

**D. C., Wash.** — DREDGING LADDER — Dec. 23, by U. S. Eng., 1068 Navy Bldg., dredging ladder complete with cutter engine; adv. E. N.-R. Nov. 27.

**D. C., Wash.** — FUEL OIL — Dec. 3, A. L. Flint, genl. purch. agt., Panama Canal, fuel oil for period beginning Jan. and ending Dec. 31, 1931, Schedule 2606.

**Idaho**—WATER SYSTEM—U. S. Natl. Parks, bids about Apr. 1, water system for Moon and Crater Lakes National Parks. Former bids rejected. E. B. Seechrist, San Francisco, Calif. engr. Noted Jan. 2.

**Ill., Belleville** — BARRACKS — Dec. 19, at office Con. Q. M., Scott Field, 1 air corps barracks and 1 set double non-commissioned officers quarters; adv. E. N.-R. Nov. 27.

**Ill., Pekin**—EXTENDING, etc.—Dec. 17, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office.

**Mass., Boston**—LUMBER, etc.—Dec. 2, by Bureau Supplies & Accounts, Navy Dpt., Wash., D. C., lumber, steel pipe, electrical drills, twist drills, pliers, at U. S. Navy Yard, here.

**Mass., Fall River**—POST OFFICE—Dec. 1, by Treas. Dpt. at office Sup. Archt., 2 story, basement, brick, stone, granite. Former bids rejected. Noted Oct. 16.

**N. J., Fort Monmouth**—QUARTERS—Dec. 9, at office Con. Q. M., 6 double sets non-commissioned officers quarters; adv. E. N.-R. Nov. 27. Former bids rejected. Noted Nov. 20.

**N. Y., Brooklyn**—POLES—Dec. 9, by Signal Supply Officer, New York General Depot, 58th St. and 1st Ave., poles.

**Okla., Oklahoma City**—EXTENDING, etc.—Dec. 23, by Treas. Dpt., at office Sup. Archt., extending, remodeling (except elevators) U. S. Post Office.

**Pa., Phila.**—SEWER—Dec. 16, at office Con. Q. M., Frankford Arsenal, intercepting sewer; adv. E. N.-R. Nov. 27.

**Pa., Pittsburgh**—HYDRO-ELECTRIC PLANT—Dec. 19, by U. S. Eng., 1 hydro-electric plant for Lock 8, Allegheny River; adv. E. N.-R. Nov. 27.

### CONTRACTS AWARDED

**Arkansas**—EARTHWORK—U. S. Eng., Vicksburg, Miss., placing 15,000 cu.yd. earthwork on south bank and 10,000 cu.yd. earthwork in Pendleton New Dike, both on Arkansas River, to D. Elkas, Dumas, at $0.40 and $0.274 per cu.yd. respectively. **Noted** Oct. 29 Daily.

**Arkansas**—EARTHWORK—U. S. Eng., P. O. Box 667, Vicksburg, Miss., 815,000 cu.yd. levee enlargement and turnover work on south bank Arkansas River, in Douglas Levee Dist., to Brookings-Callaway Co., Box 2120, Atlanta, Ga., at $0.1775 per cu.yd. Noted Sept. 29.

**D. C., Wash.**—SENATE APPROACH—U. S. Govt., D. L. Lyon, archt., Capitol, approaches to Senate office building, to G. A. Fuller Co., Munsey Bldg., $189,000.

**Ga., Augusta**—HOSPITAL—Vet. Bu., acute building at U. S. Veteran's Hospital, to W. P. Rose Co., Goldsboro, N. C., $213,000. Noted Oct. 23.

**Ky., Harrodsburg** — POST OFFICE — Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office, to Fanning & Sweeney, Greensburg, N. C., $62,200. Noted Oct. 23.

**Me., South Portland** (br. Portland)—PILING—Superintendent of Lighthouses, Portland, steel sheet piling, inclosed wharves, dredging for lighthouse depot, to Merritt Chapman & Scott Corp., 292 Pequot Ave., New London, Conn., (1) $184,300 (2) $170,000. Noted Sept. 25.

**Mo., Jefferson Barracks**—ALTERING—Vet. Bu., altering Building 25, to G. Lay, Inc., St. Louis, $13,472. Noted Nov. 20.

**South Dakota** — ROAD — P. Rds., Custom House, Denver, Colo., graveling or crushed rock surfacing 5.675 mi. Deadwood-Custer-Hot Springs Forest Project, Pennington Co., to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., $36,813.

**Tex., Mexia**—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office, to Samford Bros., 301 Washington St., Montgomery, Ala., $71,045. Noted Oct. 23.

**Utah, Ogden**—ELEVATORS—Treas. Dpt. at office Sup. Archt., passenger elevators, at U. S. Federal Building, to Otis Elevator Co., 50 Exchange Pl., Salt Lake City, $13,000. Noted Oct. 9.

**Wash., Seattle** — FISHERIES BUILDING — Bur. Fisheries, 2 story, 50 x 120 ft., brick, stone, concrete, Hamlin St. and Montlake Blvd., to Western Constr. Co., Seaboard Bldg., $101,200. Noted Oct. 23.

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## RAILWAYS

### PROPOSED WORK

**Colorado** — Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., c/o J. R. Hitchcock, genl. mgr. Western Lines, Amarillo, Tex., rebuilding 1.5 mi. track through lower Park Hill, also plans in spring steel bridge on concrete piers over Fountain Creek in Pueblo. $500,000.

**Maryland**—Pennsylvania R.R., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., produce terminal (refrigeration) in Baltimore. To exceed $600,000. **Maturity after Jan. 1, 1931.** Noted Aug. 28.

**Utah**—Utah Rock Asphalt Co., C. N. Power, mgr., 1st Natl. Bank Bldg., Pueblo, Colo., 2 mi. standard gage railroad track from company's asphalt quarry to crushing mills, at Sunnyside.

## SUBWAYS AND TUNNELS

### PROPOSED WORK

**New York** — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, subway along Queens Blvd., from 55th Ave. to 64th Rd., Long Island City to Jamaica. To exceed $5,000,000.

**Que., Montreal**—City, bath at Prefontaine St. $90,000.

### BIDS ASKED

**New York**—Bd. Transportation, J. H. Delaney, 250 Hudson St., New York, bids about Jan. 15, vehicular tunnel from East 38th St., New York, to Long Island City. $85,000,000. Noted Aug. 8, 1929.

### CONTRACTS AWARDED

**N. Y., New York**—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., enclosure at Canal Street Station of Bway.-4th Ave. Rapid Transit R.R., to Eastern Constr. Co., Kings Highway, Brooklyn, $3,205. Noted Oct. 30.

## GRADE CROSSINGS

### PROPOSED WORK

**N. Y., Catskill**—West Shore R.R. Co., c/o New York Central R.R. Co., F. B. Freeman, 466 Lexington Ave., New York, eliminating Hannocroix Crossing at New Baltimore-Coeymans Hy. $122,000.

**N. Y., Hoosick**—Boston & Maine R.R. Co. W. J. Backes, ch. engr., Boston, Mass., grade crossing elimination over tracks at River St.

**N. Y., Hudson Falls**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, grade crossing known as Dunhams Basin, over tracks here. $100,000.

**N. Y., Long Island City**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grade separation to carry Woodhaven Blvd. over Queens and Nassau Blvds. $555,800.

**N. J., Perth Amboy** — City, underpass at Pennsylvania R.R. to A. Christensen, 80 Broad St., Elizabeth, $45,900.

**Utah, Salt Lake City**—City and Denver & Rio Grande Western R.R. Co., A. O. Ridgway, ch. engr., Equitable Bldg., Denver, Colo. preliminary plans two 15 ft. concrete overpass structures, retaining walls, earth fill approaches on 13th East St. $26,000. H. Jesser, city engr.

**Ont., Sudbury**—Canadian Pacific Ry., J. M. R. Fairbairn, ch. engr., Montreal, Que., soon takes bids subway. $100,000.

### CONTRACTS AWARDED

**N. Y., New Castle**—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing on Echo-Lake-Pines Bridge Co. Hy., to Bates & Rogers Constr. Co., 75 West St., New York, $58,825. Noted Sept. 18.

**Pa., Erie**—New York Central R.R. Co., 466 Lexington Ave., F. B. Freedman, ch. engr., subway under tracks on Ashbury Chapel Rd., to Walsh Constr. Co., Des Moines, Ia., $65,548.

**Utah**—State Rd. Comn., Salt Lake City, steel, concrete overpass bridge over Union Pacific R.R., Tooele Co., to Christensen & Gardner, Salt Lake City, $41,802. Est. $46,000. Noted Nov. 13.

## PIERS AND WHARVES

### CONTRACTS AWARDED

**Md., Baltimore**—PIER, etc.—Canton Co., Canton House, 2 story, concrete, rein.-con., brick, structural steel pier, freight and passenger shed, 900 ft. long, Pier 10, to Sanford & Brooks Co., Canton House, $500,000.

## AIRPORTS

### PROPOSED WORK

**Mo., Bridgeton**—City, c/o Bd. P. Serv., 208 City Hall, St. Louis, rein.-con., brick, terra cotta airport terminal building, incl. offices, hotel rooms, restaurant, at St. Louis Flying Field. $150,000. B. R. Shaw, Inc., 810 Olive St., St. Louis, engr.

### BIDS ASKED

**Mass., East Boston** (sta. Boston)—Dec. 4, by City of Boston, Park Dpt., 33 Beacon St., timber seaplane ramp at airport.

### CONTRACTS AWARDED

**La., Shreveport**—Field Lighting system for municipal airport, to Course-Hinds Co., Syracuse, N. Y. Noted June 12.

**N. J., Newark**—Bd. City Comrs., City Hall, general contract 1 and 2 story, basement, airplane hangars and office, and 2 lean-tos, Municipal Airport, to E. W. Sproul Constr. Co., 2001 Pershing Rd., Chicago, Ill.; face brick, to Decker Building Materials Co., 515 Lyons Ave., Irvington; steel sash and steel, to Truscon Steel Co., 605 Broad St.; carpentry and masonry, to T. F. Conroy, Maplewood; plumbing and heating, to Shier & Okun, 225 North Wood Ave., Linden; electrical work, to P. H. Jaehnig, Inc., 106 Academy St.; roofing and sheet metal, to P. Carey Co., 389 Park Ave.; iron work, to Eureka Iron Wks., 177 Vanderpool St.; flooring, to Newark Parquet Flooring Co., 10 Boston St.; limestone, to Davidson Bros., Inc., 121 Passaic Ave., Harrison; glass and glazing, to Pittsburgh Plate Glass Co., 290 Elizabeth Ave. Est. $150,000. Noted Oct. 23 Daily.

**Pa., Pittsburgh**—Allegheny County Airport, c/o J. A. Fugassi, supt. roads, airport in Mifflin Twp., incl. one 1 mi. and two 0.5 mi. runways each 500 ft. wide, one 0.75 mi. runway to hangars, air cooled slag, crushed gravel or both, rolled and with asphalt penetration treatment, also 3 mi. concrete drains either side runways, tapered dimensions from 5 in. to 5 ft. diam., open top for gratings, using premixed or truck mixed concrete, own forces. N. F. Brown, 519 Smithfield St., engr.

## POWER AND LIGHTING

### PROPOSED WORK

**Ind., Auburn**—City Council, reconstructing electric light and power lines. $31,000. C. Brosman, Chamber of Commerce Bldg., Indianapolis, engr.

**Que., Montreal**—City, subway at St. Hubert St. $500,000.

### BIDS ASKED

**N. Y., New York**—Dec. 4, by A. Goldman, comr. Plant & Structures, Municipal Bldg., furnishing and installing conduit system and lampposts on approach to upper roadway of Queensboro Bridge; furnishing, installing lighting equipment on roadway of Queensboro Bridge.

**N. Y., New York**—Dec. 5, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., telephone and emergency alarm equipment, for portion Independent System City-owned Rapid Transit R.Rs. from Fulton to 207th Sts., and 207th Street Yard.

## Power and Lighting (Continued)

### CONTRACTS AWARDED

**N. Y., Brooklyn**—J. J. Dorman, comr. Fire Dpt., underground fire alarm system in Greenpoint and Williamsburg Impvt., to W. E. Blume, Inc., $13,088. Noted Oct. 23.

## SPORTS AND PARKS

### PROPOSED WORK

**Mass., Boston**—City, Park Dpt., stadium, Dunbar Ave., near high school grounds, Dorchester. $100,000. J. J. Murphy, 33 Beacon St., engr. Noted Oct. 9.

**N. J., Union City** — Bd. City Comrs., City Hall, municipal stadium, Summit Ave. and 26th St. $100,000. **Maturity in spring.** H. Thourot, city engr. Noted Oct. 16.

**Que., Montreal**—City, bath at Prefontaine St. $90,000.

### BIDS ASKED

**N. J., Spring Lake**—Dec. 8, by Mayor and Common Council, pavilion for bathing purposes. $125,000. M. Morris, boro clk.

**N. Y., Piermont**—Lucht & Anderson, archts., 432 Palisade Ave., Cliffside, bids about Mar. 1, general contract 1 and 2 story, brick, timber pavilion, frame bath houses, concrete, tile swimming pool, for H. and H. Corp., c/o architects. $150,000. Noted Nov. 6.

### CONTRACTS AWARDED

**N. J., Newark**—Bd. Educ., City Hall, grading, excavating, retaining walls, at Ridge St. and grading, excavating, drive for new playground to J. Richliano, 105 Clifton Ave., $17,390 and $17,165 respectively. Noted Oct. 24 Daily.

**N. Y., Freeport**—Bd. Town Council, municipal stadium, 3,000 seating capacity, to S. S. Thompson Co., Inc., Red Bank, N. J., $50,000. Noted Oct. 2.

**N. Y., New York**—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, repairing Thomas Jefferson Park, to Arrow Constr. Co., 1962 Hobart Ave., $3,024; completing comfort station at Colonial Park, to A. I. Heidt, $298; installing book conveyors in New York Public Library, to Snead & Co., 205 East 42nd St., $12,320; comfort station and plumbing at New York Zoological Gardens, to L. Kaplovitz, $20,570 and $8,100 respectively; heating, to G. J. Tanzer, 327 West 43rd St., $2,880. Grand total $47,192. Noted Nov. 6.

## HEATING AND VENTILATING

### CONTRACTS AWARDED

**Mass., Palmer** — Commonwealth of Massachusetts, Dpt. Mental Diseases, heating in female nurses home and reception hospital, Monson State Hospital, to J. H. Larkin, 203 Corey Rd., Brookline; plumbing, to T. J. Conway Co., 77 Winter St., Springfield; electrical work, to Springfield Electric Co., 51½ Taylor St., Springfield. Est. $30,000. Noted Nov. 13 under "Hospitals."

**N. J., Bay Head**—Bd. Educ., heating, plumbing, ventilating in grade school, to A. G. Van Cleve, Ocean Grove; electrical work, to L. K. Green, 620 Atlantic Ave., Point Pleasant. Noted Nov. 20, under "Schools."

**N. Y., Douglaston** — Bd. Educ., 500 Park Ave., New York, heating in P. S. 98, to D. J. Rice, Inc., 41-50 38th St., Long Island City, $54,900; plumbing, to W. J. Endres, Inc., 30-65 39th St., Long Island City, $18,118; electrical work, to Tucker Electric Constr. Co., 124 East 25th St., New York, $15,379. Grand total $88,397. Noted Oct. 16.

**N. Y., Richmond Hill Circle**—Bd. Educ., 500 Park Ave., New York, heating P. S. 124, to D. J. Rice, Inc., 41-50 38th St., Long Island City, $29,670; plumbing, to Triboro Eng. Co., Chatham-Phoenix Bldg., Long Island City, $9,887; electrical work, to Tucker Electric Constr. Co., 124 East 25th St., New York, $10,238. Grand total $49,795. Noted Oct. 16.

**N. Y., South Jamaica**—Bd. Educ., 500 Park Ave., New York, heating in P. S. 123, to Clermont Heating Co., 480 Clermont Ave., Brooklyn, $23,970; plumbing, to Triboro Eng. Co., Chatham-Phoenix Bldg., Long Island City, $8,294; electrical work, to Tucker Electric Constr. Co., 124 East 25th St., New York, $9,423. Grand total $41,677. Noted Oct. 16.

**O., Cleveland**—City, plumbing, heating for Lakefront Stadium, to Kahn Co., 7804 Carnegie Ave., $119,322.

## UNCLASSIFIED

### PROPOSED WORK

**Mass., Newton**—LAND DEVELOPMENT—Gray Realty Trust, 35 Laudholm Rd., Newtonville, developing land on Cotton St. and Alderwood Rd. for building purposes, incl. grading, drainage, sewerage and waterworks. $25,000 or more. Private plans.

**Mo., St. Louis**—CREMATORY—Bd. P. Serv., preliminary plans brick, concrete crematory, incl. chapel, repository, near Potters Field, south of Arsenal St. $25,000. Private plans.

**N. Y., Dunkirk**—DOCK—Sinclair Refining Co., 45 Nassau St., New York, soon lets contract waterfront dock, bulk oil storage facilities, tanks, etc. To exceed $100,000.

**O., Steubenville**—COKE CHUTE—Wheeling Steel Corp., Wheeling Steel Corp. Bldg., Wheeling, W. Va., coke chute, La Belle Bridge. To exceed $40,000.

**Pa., Baden**—BARGE DOCKS and FACILITIES—Pennsylvania R.R. Co., Broad St. Sta., Phila., T. J. Skillman, ch. engr., barge docks and facilities for transfering coal from barges to cars, capacity 1,000,000 tons annually. To exceed $100,000.

**Utah, Cedar City**—SWITCHBOARD EQUIPMENT—Mountain States Telephone & Telegraph Co., 56 State St., Salt Lake City, installing central station switchboard equipment. $36,485.

**Que., Montreal**—COMFORT STATIONS—City, 10 comfort stations. $250,000.

### BIDS ASKED

**N. Y., New York**—COMFORT STATION—Dec. 2, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., Comfort Station 21, McKinley Sq. and Franklin Ave.

**N. Y., Pine Aire Station**—ELEVATORS—Dec. 17, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electric elevators in Buildings 1, 2 and 3; refrigeration work, heating, sanitary work and kitchen equipment, Building 3, at Pilgrim State Hospital, Suffolk Co.; adv. E. N.-R. Nov. 27.

**Tex., Beaumont**—JAIL EQUIPMENT—Dec. 15, by Jefferson Co., c/o B. B. Johnson, judge, jail equipment for Court House. $155,000. F. C. Stone, Goodhue Bldg., archt.

**British Columbia**—TELEPHONE CIRCUIT—See "Contracts Awarded."

### CONTRACTS AWARDED

**Calif., Ventura**—SUBMARINE PIPE LINE—Associated Oil Co., P. E. Bldg., Los Angeles, 3,200 ft. 10 in. submarine pipe line for loading purposes, to Merritt-Chapman & Scott Corp., 720 Wilmington Ave., San Pedro, $55,000.

**Conn., West Haven** (br. New Haven)—OIL TANKS — West Haven Oil Co., Water St., E. Shiner, 5 oil tanks and 135 ft. bulkhead. $30,000. Owner builds. Private plans.

**Ind., Indianapolis** — Water TREATING PLANT — Baltimore & Ohio Ry. Co., Baltimore, Md., H. A. Lane, ch. engr., water treating plant, brick, steel, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Est. $27,000.

**N. J., Carlstadt**—BROADCASTING STATION—Amer. Radio Corp., 235 East 45th St., general contract 1 story, basement, brick, steel, Hackensack Meadows, to Blaw Knox Co., 342 Madison Ave., New York; tower foundations, to Skinner & Cook, 60 East 42nd St., New York. Est. $40,000 or more. Noted Oct. 16.

**N. Y., New York** — ELEVATOR EQUIPMENT — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., to Otis Elevator Co., 11th Ave. and 26th St., passenger elevator equipment at 181st and 191st Street Stations, $168,615; escalator equipment at 181st Station, $40,540; freight elevator at 207th Street Yard, $34,365. Grand total $243,520. Noted Oct. 23.

**Pa., Hannastown**—COAL CLEANING PLANT—Jamison Coal & Coke Co., R. E. Jamison, secy., Main St., Greensburg, steel, sheet metal siding, incl. conveyors, complete washing equipment, Westmoreland Co., to Fairmount Mining Mchy. Co., Fairmont, W. Va.

**Pa., Pittsburgh** — ELEVATORS — Graham, Anderson, Probst & White, archts., 80 East Jackson Blvd., Chicago, Ill., installing 10 new automatic elevators, incl. new enclosures and other alterations 20 story office building, 5th and Grant Sts., for H. C. Frick Estate, Frick Bldg., to W. F. Trimble & Sons Co., 1719 Penna Ave. Est. $300,000. Noted Oct. 9.

**Va., Cape Charles**—TERMINAL, etc.—Peninsula Ferry Corp., terminal and dredging, to W. L. Jones Co., Elizabeth City, N. C. Est. $50,000 each.

**British Columbia**—TELEPHONE CIRCUIT—British Columbia Telephone Co., 768 Seymour St., Vancouver, 530 mi. Trans-Canada telephone circuit in British Columbia, day labor. $1,250,000. Private plans. Work under way.

## MATERIALS

### BIDS ASKED

SHUT-OFF BOXES and CORPORATION COCKS — **Chicago, Ill.** — Nov. 29, by City, City Hall, ten thousand 1½ in. shut-off boxes at various pipe yards; eight thousand ¾ in., five hundred 1 in. and one hundred 2 in. corporation cocks and two hundred ¾ in. corporation cock coupling nuts and tail pieces, at 3150 South Sacramento Ave. R. W. Wolfe, comr. P. Wks.

TREATED LUMBER—**Chicago, Ill.**—Nov. 29, by City, at office Dpt. P. Wks., City Hall, 77,349 ft. treated yellow pine lumber for Navy Pier. E. W. Wolfe, comr. P. Wks.

WATER PIPE—**Chicago, Ill.**—Dec. 5, by City, at office Dpt. P. Wks., City Hall, furnishing, delivering 985 tons 12 in. c.i. water pipe, f.o.b. cars at various City Pipe Yards. R. W. Wolfe, comr.

LUMBER, HARDWARE, etc.—**Audubon, Ia.**—Dec. 3, at office Auditor Audubon Co., lumber, hardware, piling, paint.

BRIDGE LUMBER and PILING—**New Hampton, Ia.**—Dec. 1, at office Auditor Chickasaw Co., bridge lumber, piling.

CULVERT PIPE and LUMBER—**Vinton, Ia.**—Dec. 2, at office Auditor Benton Co., 15- to 30-in. corrugated culvert pipe, 147,232 ft. lumber.

CAST IRON PIPE, etc.—**Boston, Mass.**—Dec. 4, by Supply Dpt., P. A. Chapman, supt., 200 tons 6 in., 500 tons 8 in., 200 tons 10 in. 1,000 tons 12 in., 250 tons 16 in. Class B pipe, 30 tons special castings, 24- to 48-in. stock to Water Service Dpt.; c.i. water pipe and special castings for high pressure fire service as specified, to Pub. Wks., Dpt., Supply Dpt.

STRUCTURAL STEEL — **Phila., Pa.** — Nov. 28, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 North 32nd St., structural steel, Contr. 33-1930.

CAST IRON PIPE — **Midvale, Utah** — See "Waterworks under Contracts Awarded."

### CONTRACTS AWARDED

SLAG TAR and ASPHALT — **Mississippi** — State Hy. Comn., Jackson, 6 months supply of slag, tar and asphalt f.o.b. plant or factory plus freight prepaid to destination, to Birmingham Slag Co., Comer Bldg., Birmingham, Ala., to American Tar Products Co., Koppers Bldg., Pittsburgh Pa., to Asphalt Roads Co., Chattanooga, Tenn., to Standard Oil Co. of Louisiana, 2134 St. Charles Ave., New Orleans, La., to Mexican Petroleum Corp. of Louisiana, Rhodes-Haverty Bldg., Atlanta, Ga., and to Carter-Waters Corp., 2049 Main St., Kansas City, Mo.

TAR—**New York, N. Y.**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 25,000 gal. tar for patching, to Barrett Co., 40 Rector St., $3,473. Noted Nov. 6.

TREATED and UNTREATED TIES — **New York, N. Y.** — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., treated and untreated ties, to Jennison Wright Lumber Co., 30 Church St., $102,212; rail protection boards, to Wylly Tie & Lumber Co., 112 East 42nd St., $18,390. Noted Oct. 30.

## EQUIPMENT

### PROPOSED WORK

MOTOR TRUCK — **Santa Ana, Calif.** — Bd. Comrs. Orange Co. purchasing 2 ton motor truck for Road Dpt. N. H. Neff, co. road comr.

### BIDS ASKED

MOTOR TRUCK CHASSIS—**Madera, Calif.**—Dec. 2, by L. W. Cooper, clk. Madera Co., motor truck chassis, not less than 3,500 lb. capacity.

CATERPILLAR TRACTOR—**Price, Utah**—Comrs. Carbon Co. in market caterpillar tractor.

## FOREIGN

**England, Liverpool**—Mersey Docks & Harbour Bd., supplying, erecting 3 rolling bascule bridges, of which 2 will carry railroad and road accommodations, and other has road accommodation only, here, to Dorman, Long & Co. Ltd., Middlesbrough and London, £96,969.

**Germany, Cologne**—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., soon lets contract manufacturing and assembly plant. To exceed $1,000,000.

**Jamaica, Kingston**—United Fruit Co., 1 Federal St., Boston, Mass., cane sugar refinery. $500,000. **Maturity indefinite.**

**Mexico, Mexico City**—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., soon lets contract assembly plant. $1,000,000.

**Poland** — Dpt. Agriculture, Warsaw, surveys by MacDonald Eng. Co., 420 Lexington Ave., New York, for possible construction grain elevators throughout country. To exceed $1,000,000.

**Poland, Gdynia**—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., plans manufacturing and assembly plant. To exceed $1,000,000.

**South Africa** — South African Steel & Iron Industrial Corp. Ltd., 82 Marshall St., Johannesberg, awarded contract for steel melting shop and rolling mills for new plant at Pretoria, to Dorman, Long & Co. Ltd. and Messrs. Demag, Middlesborough and London, England. Noted Dec. 5, 1929.

# Buildings

## BUILDINGS—RESIDENTIAL

### BIDS ASKED

**Mass., Boston**—Owner, c/o G. R. Grantham, trustee, 44 School St., soon takes bids hotel addition, 17-19 Beacon St. To exceed $150,000. W. W. Dinsmore, 8 Beacon St., archt. Hotel Bellvue, 21 Beacon St., lessee.

**N. Y., New York**—See "Contracts Awarded."

**O., Cleveland**—I. Koslen, 1727 Cumberland Ave., taking bids 4 story, basement, 52 x 116 ft., brick, Euclid Heights Blvd. $150,000. L. R. Walker, 1900 Euclid Bldg., archt.

### CONTRACTS AWARDED

**Miss., Jackson**—C. N. Flowers (owner and contractor) will erect 4 story, brick, stone apartment. $150,000. Owner builds.

Buildings—Residential (Continued)

**Ga., Macon**—Midland City Hotel Co., c/o H. M. Block, Hotel Dempsey, 6 story, basement, brick, rein.-con., steel hotel, 3rd St., to Angle-Blackford Co., American Exch. Bank Bldg., Greensboro, N. C. Est. $400,000.

**Md., Baltimore**—T. Mullan, 3945 Greenmount Ave., 10 story, basement, 200 x 290 ft., brick, steel, concrete, stone, 39th St. and Canterbury Rd. $1,000,000. Owner builds. L. T. Rouleau, 2021 Massachusetts Ave., Wash., D. C., archt. Noted Nov. 20.

**N. Y., New York** — H. Aginsky, 701 East Tremont Ave., 6 story, 65 x 88 ft., Marion Ave., separate contracts. $150,000. H. Nordheim, 565 East Tremont Ave., archt.

**N. Y., New York**—Bestway Realty Co., M. Galt, vice pres., 277 Bway., 6 story, 73 x 120 ft., 222nd St. and White Plains Ave., separate contracts. $150,000. M. Rotholz, 2419 Webster Ave., archt.

**N. Y., New York**—F. Del Balso & Sons, 1933 West Farms Rd., 6 story, 75 x 84 ft., Davidson Ave. and 190th St., separate contracts. $150,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., archts.

**N. Y., New York**—Harmo Building Corp., 701 East Tremont Ave., 6 story, 65 x 88 ft., brick, steel, Perry Ave. and 200th St., separate contracts. $150,000. H. Nordheim, 565 East Tremont Ave., archts.

**N. Y., New York**—J. O'Leary, 1803 Archer St., 6 story, 90 x 150 ft., Theriot Ave. and Archer St., separate contracts. $250,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., archts.

**O., Cleveland**—W. J. Schmidt, 18514 Detroit Ave., two 3 story, basement, 60 x 60 ft., brick, steel apartments, 1365-71 Clarence Ave., to M. Narosny, 11514 Hopkins Ave. Est. $150,000.

**Tenn., Union City**—Union City Hotel Co., 5 story, 75 x 100 ft., rein.-con., brick, to Meers & Wallenta, 63 South 3rd St., Memphis, $162,000. Noted Nov. 20.

## CLUBS

### PROPOSED WORK

**Ill., Chicago**—Northern Athletic Club, 2310 Lawrence Ave., plans by W. G. Uffendell, 39 South State St., 10 story, 104 x 125 ft. rein.-con., brick, Oakley and Lawrence Aves. $1,000,000.

**N. J., Jersey City** — Polish-American Social Club, S. Osiechki, pres., 176 Pavonia Ave., sketches by P. Simeone & Co., 22 Journal Sq., 3 story, basement, brick, steel, plain found. $150,000. Noted Nov. 13.

### CONTRACTS AWARDED

**N. J., Collingswood**—Ancient and Accepted Scottish Rite Freemasons, F. E. Hineline, 39 South 6th St., Camden, 4 story, basement, tower consistory cathedral, to F. V. Warren Co., 15th and Locust Sts., Phila., Pa. Noted Nov. 13.

## HOSPITALS

### PROPOSED WORK

**Conn., Harford** — City, W. E. Batterson, mayor, City Hall, plans by Ebbets & Frid, 15 Lewis St., brick, stone, steel hospital. $600,000. W. H. Walsh, 612 North Michigan Ave., Chicago, engr.

**N. J., Bernardsville** — Owner, c/o W. M. Stanton, archt., Land Title Bldg., Phila., Pa., sanitarium. $150,000. **Maturity probably soon.**

**N. J., Newark**—St. Barnabas Hospital, J. G. Martin, supt., 685 High St., plans by J. H. and W. C. Ely, 605 Broad St., hospital, nurses home, power house, High St. $1,500,000. **Maturity indefinite.** Noted Oct. 23.

### BIDS ASKED

**Ark., Benton**—Dec. 15, by State Hospital for Nervous Diseases, c/o State Constr. Comn., J. M. Hill, chn., Ft. Smith, (1st unit) hospital group, incl. 4 dormitories, 1 assembly building, cafeteria and kitchen, rein.-con., brick, Lund Eng. Co., Home Insurance Bldg., Little Rock, engrs., Mann, Wanger & King, Donagney Bldg., Little Rock, and Hot Springs, and S. W. Jones, 25 West 45th St., New York, archts. Drilling water well, awarded to L. B. Clifford, 5 Webber Pl., Texarkana. Noted Sept. 25.

**N. J., Holmdel**—Dec. 12, by C. N. Leathem, state archt., State Office Bldg., Trenton, 3 story hospital, for Dpt. Institutions & Agencies, Trenton. $800,000.

**N. Y., New York**—N. H. Hunt, 1440 Bway., taking bids separate contracts 6 story hospital, 341 Convent Ave., for Lutheran Hospital of Manhattan, Convent Ave. and 144th St. $150,000. E. Djorup, 1345 Chisholm St., archt. Noted Nov. 6.

### CONTRACTS AWARDED

**N. J., Secaucus**—Hudson Co., Court House, Jersey City, general contract 4 story, basement, brick, steel, hospital addition, plain found., to Dalton Millimet Co., 30 Church St., New York. Est. $150,000. Noted Oct. 20 Daily.

**Pa., Phila.**—City, Dpt. P. Health, A. A. Cairns, dr. City Hall Annex, Tuberculosis Hospital 5 and 6 story, basement, 55 x 104 ft., with two 30 x 116 ft. and two 31 x 63 ft. wings, steel, rein.-con., plain founds., 34th and Pine Sts., to Wark Co., 1608 Walnut St., $708,900.

## CHURCHES

### PROPOSED WORK

**N. J., Perth Amboy**—St. Mary's Roman Catholic Church, c/o G. W. Brooks, archt., 216 Smith St., sketches 2 story, basement, brick, steel convent, plain found. $150,000.

### BIDS ASKED

**N. J., Red Bank**—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., bids about Feb. 1, revising plans and takes bids about Feb. 1, general contract 3 story, basement, brick, steel, plain found., Broad St. and LeRoy Pl., for First Methodist Church of Red Bank, F. A. DiMaris, pastor, $250,000. H. T. Tralle, Pinehurst Ave. and 183rd St., New York, consult. archt. Noted Sept. 19 Daily.

**N. J., Wildwood**—Nov. 28, by Stackhouse & Donohue, archts., 313 South Smedley St., Phila., Pa., general contract 2 story, basement, brick, steel plain found., for Trinity Lutheran Church, $150,000.

### CONTRACTS AWARDED

**N. J., Milltown**—A. Merchant, archt., 1 Elm Row, New Brunswick, general contract 2 story, basement, brick, steel rectory, plain found., to J. N. Wester, 320 Amboy Ave., Metuchen, for Our Lady of Lourdes. Est. $150,000. Noted Oct. 30.

## SCHOOLS

### PROPOSED WORK

**Ia., Ft. Dodge**—Bd. Educ., E. E. Peterson, secy., soon takes bids Junior High School, 2 story, baseemnt, rein.?con., brick, stone. $225,000. E. O. Damon, Jr., 19 East Mason Bldg., and F. W. Griffith, 400 Snell Bldg., assoc. archts. Noted Sept. 11.

**Mass., Cambridge**—City, School Comn., Rindge Technical School, Broadway, Felton and Cambridge Sts. and grounds of Public Library. $1,500,000. Architect not selected.

**Mass., Lakeville**—Town, A. B. Weber, supt. School Dpt., Pierce St., Middleboro, altering and constructing 2 story, basement school addition. $150,000. Architect not selected.

**Mass., Lowell**—City, T. H. Braden, mayor, City Hall, elementary school, Oaklands Sect. $200,000. Architect not selected.

**Mass., Lynn**—City, H. S. Gruver, supt. Schools, Administration Bldg., Junior High School, West Lynn Sect. To exceed $150,000. Architect not selected.

**Mass., Milton** (br. Boston)—Town, C. M. Rogerson, chm. Building Com., sketches by Shepard & Stearns, 65 Franklin St., Boston, 2 story, basement, brick school, incl. manual training room, gymnasium, Elliott St. $280,000. Noted Feb. 6.

**Mich., Flint**—Bd. Educ., H. Cook, pres., revised plans by Malcolmson, Higginbotham & Trout, 1217 Griswold St., Detroit, 2 and 3 story, basement, brick, steel, rein.-con., stone, plain found., Longfellow site. $300,000. **Maturity indefinite.** This corrects report in Nov. 13 issue.

**Miss., Jackson**—Bd. School Trustees new building and grammar school additions. $300,000.

**Mo., Kansas City**—Bd. Educ. plans by C. A. Smith, 800 Finance Bldg., 3 story, basement, brick, steel addition to East High School, incl. gymnasium, auditorium. $400,000.

**Neb., Omaha**—Bd. Educ., O. L. Eastman, bus. mgr., soon takes bids 3 story, basement, brick, stone, rein.-con., addition to Central High School, 22nd and Dodge Sts. $250,000. J. Latenser & Sons, Peters Trust Bldg., archt.

**N. H., Exeter**—Phillips Exeter Academy plans by Cram & Ferguson, 248 Boylston St., Boston, Mass., 4 dormitories, to exceed $250,000 each. **Maturity indefinite.**

**N. H., Manchester**—City, School Dept., 88 Lowell St., plans new Junior High School, and addition to Grade School, Willow St. To exceed $150,000. Architect not selected.

**N. J., Irvington** (br. Newark)—Bd. Educ., 1253 Clinton Ave., altering and constructing 2 story, basement, brick, steel addition, Grove St. Project in abeyance. Noted Oct. 23.

**N. J., Mahwah**—Bd. Educ., School Bldg., sketches by Guilbert & Betelle., 20 Branford Pl., Newark, 2 story, basement, brick, steel. $150,000. Noted Aug. 21.

**N. J., New Market**—Bd. Educ. sketches 2 story, basement, brick, steel, Washington Ave. and 7th St. $150,000.

**N. J., New Market** — Bd. Educ., sketches 2 story, basement, brick, steel, plain found., River Rd. $150,000.

**N. J., Newton**—Bd. Educ., High School, revised sketches by Hacker & Hacker, 201 Main St., Fort Lee, Junior High School, 2 story, basement, brick, steel. $150,000. Noted Aug. 7.

**N. J., North Plainfield** (mail Plainfield)—Bd. Educ., 125 Sommerset St., 2 story, basement, brick, steel, East End Sect. $150,000. Architect not selected. **Maturity indefinite.**

**N. J., Ventnor** (br. Atlantic City)—St. James Roman Catholic Church, G. Moran, pastor, sketches by E. G. Perrot, 1211 Arch St., Phila., Pa., 3 story, brick, steel school, convent, plain found., Portland Ave. $200,000.

**N. J., Washington** — Bd. Educ., Boro Hall, sketches by C. G. Jones, 280 Bway., New York, 2 story, basement, brick, steel high school, Carlton Ave. $150,000.

**N. J., Woodbridge**—Bd. Educ., Barron Ave., sketches by Jensen & Rasmussen, 218 Smith St., Perth Amboy, 2 story, basement, brick, steel addition to Junior High School, School St. $150,000.

**Que., Montreal** — Roman Catholic School Comn., 117 Ste. Catherine St. W., plans by H. Vautrin, 10 St. James St. E. D'Arcy McGee School, Jeanne Mance St. $250,000.

### BIDS ASKED

**Ill., Chicago**—Dec. 9, by Bd. Educ., 188 W Randolph St., E. Withall, bus. mgr., Verd Junior High School, 56th and Rockwell St P. Gerhardt, 188 West Randolph St., archt $1,500,000.

**Ill., Quincy**—Bd. Educ., Musselman Bldg., W E. White, secy., bids about Dec. 1 (extended date), 3 or 4 story, 6 story tower, irregula sized, rein.-con., brick, stone, incl. swimmin pool, 14th St. near Maine St. $1,500,000. J H. Chubb, 109 North Dearborn St., Chicago archt. Behrensmeyer & Haefner, Quincy, assoc archts. Noted Sept. 18.

**Mass., Haverhill**—See "Contracts Awarded

**Mass., Holyoke**—Dec. 4, by City, Bd. Educ 3 story, 150 x 235 ft., brick, steel vocationa school, Beech St. $250,000. Geo. P. B Alderman Co., 316 High St., archts. Noted Oct. 9.

**N. Y., Flushing**—Dec. 2, by W. C. Martin archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 24, Holly Ave. from Union to Robinson Sts., for Bd. Educ., 500 Park Ave., New York.

### CONTRACTS AWARDED

**Calif., San Francisco**—Roman Catholic Archbishop, 1100 Franklin St., 4 story, convent addition, 2 story school addition, both concrete, Ashbury and Waller Sts., to D. Paganini, 519 California St., $155,000.

**Del., Newark**—Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, general contract 2 story, basement, 65 x 155 ft., brick, steel addition, plain found., to H. John Homan Co., 18th and Cherry Sts., Phila., Pa. Est. $150,000. Noted Nov. 6.

**D. C., Wash.**—District Comrs., District Bldg., general contract Theodore Roosevelt High School, to National Constr. Co., Denrike Bldg., $1,249,000. Noted Oct. 30.

**N. Y., Buffalo**—E. B. Green & Sons, archts., 1 Niagara Sq., Crosby Hall, 3 story, basement, brick, steel, to J. W. Cowper, Rand Bldg., for University of Buffalo. Noted Oct. 16.

**N. Y., Dongan Hills** (sta. Staten Island)—Bd. Educ., 500 Park Ave., New York, general contract 2 story, basement brick steel addition to P. S. 11, to Gerace Bros. & Castagna, 2660 Mansfield Rd., Brooklyn, $152,300. Noted Sept. 11.

**Pa., York**—D. N. Crider, secy. Bd. Educ., general contract 2 story, 50 x 100 ft. and 145 x 200 ft., steel, rein.-con., brick, plain found., to I. Reindollar, 939 North George St., $280,214; heating, to American Heating & Ventilating Co., 1505 Race St., Phila., $42,712. Noted Nov. 13.

## THEATRES

### PROPOSED WORK

**Mass., Boston**—Adams House Realty Corp., H. K. Noyes, pres., 857 Commonwealth Ave., sketches by A. H. Bowditch, 44 Bromfield St., theatre, 2,000 seating capacity, Adams House site, Washington St. $2,500,000. Paramount Publix Corp., Paramount Bldg., New York, lessee. Noted Nov. 20.

**Mass., Brookline**—A. H. Sawyer, 106 Sewall Ave., sketches by F. H. Gowing, 101 Tremont St., Boston, theatre, 123-129 Harvard St. $1,000,000.

## BANKS

### BIDS ASKED

**Del., Wilmington**—Fidelity Bank & Trust Co., 535 5th Ave., taking bids 15 story, basement, 64 x 92 ft., rein.-con., brick bank and office building, Orange and 9th Sts. O. D. Lowinson, 150 5th Ave., New York, archt. Noted Sept. 18.

### CONTRACTS AWARDED

**Pa., Phila.**—Philadelphia Savings Fund Society, 700 Walnut St., bank, office, 9th and Market Sts., to G. A. Fuller Co., 597 Madison Ave., New York. Est. $6,000,000.

## OFFICES

### PROPOSED WORK

**Calif., Los Angeles**—Finance Corp. of America, 811 West 7th St., sketches 13 story, basement, 65 x 120 ft., Class A office, 7th and Flower Sts. Architect not selected.

**N. J., Montclair** — Rudgers Builders Supply Co., 101 Greenwood Ave., 1 and 2 story, 102 x 352 ft. and 30 x 180 ft. wing office, garage, shop, boiler house and service rooms, Greenwood Ave., $150,000. Private plans. Public Service Production Co., 80 Park Pl., Newark, lessee. Noted Nov. 13.

**N. Y., New York**—Equitable Building Corp., F. V. Dupont, pres., 210 Bway., 2 story top addition, 120 Bway. To exceed $150,000.

**Utah, Salt Lake City**—Medical Arts Building Corp., E. W. Smith, mgr., 50 E.S.T., 10 story addition to Medical Arts Building. $350,000. Architect not selected.

**Va., Lynchburg**—Allied Arts Building Corp., Lynchburg, sketches 17 story office, 8th and Church Sts. $320,000.

### BIDS ASKED

**Del., Wilmington**—See "Banks."

**Mass., Boston**—Tomfohrde Building, A. P. Pearce, Jr., trustee, 15 State St., taking new bids reconstructing 4 story, basement, brick, steel, plain found., 37-51 Court St. $150,000. Blackall, Clapp & Whittemore, 31 West St., archts. Noted Nov. 13.

### Offices (Continued)

**N. J., Irvington** (br. Newark) — W. E. Lehman, archt., 972 Broad St., Newark, bids about Jan. 15, general contract 2 story, basement, 80 x 160 ft., brick, steel office, stores, 1015-19 Springfield Ave., for United States Realty & Investment Co., 972 Broad St., Newark. $150,000. F. and W. Grand, Inc., 151 Newark Ave., Jersey City, lessee. Noted Oct. 30.

## PUBLIC

### PROPOSED WORK

**Ind., Terre Haute**—CITY HALL—City, W. Posey, mayor, sketches, city hall. $350,000. Architect not selected.

**Minn., Minneapolis**—AUDITORIUM—City, C. Swanson, clk., City Hall, plans by Croft & Boerner, 1004 Marquette Ave., rein.-con., brick, stone, terra cotta small halls wing addition to municipal auditorium, Grant St. between Stephens and 3rd Aves. $500,000.

**N. J., Morristown**—JAIL and OFFICE—Bd. Freeholders Morris Co., Court House, bids about February, jail and office. $150,000. Palmer & Plonsky, 55 William St., New York, archts. Noted Oct. 23.

**N. J., Perth Amboy** — CITY HALL and POLICE STATION — Bd. City Comrs., City Hall, brick, steel. $150,000 or more. **Maturity indefinite.** Engineer and architect not selected.

**New York**—PRISON—Dpt. Correction, State Office Bldg., Albany, state prison group, Sullivan Co. To exceed $150,000.

**Que., Montreal**—MARKETS—City markets, St. Antoine St. $500,000, and St. James St., $275,000.

**Que., Montreal**—POLICE and FIRE STATIONS—City, 4 police and fire stations. $600,000.

### BIDS ASKED

**D. C., Wash.** — EXTENSIBLE BUILDING — Dec. 9, by District Comrs., Disrtict Bldg., extensible building, 10th and Franklin Sts. N. E.

**N. J., Bayonne**—FIRE HOUSE—Bd. City Comrs., City Hall, bids about Jan. 15, 2 story, basement, brick, steel. $150,000. L. Quien, 229 Broad St., Elizabeth, archt. Noted Oct. 30.

**N. J., Elizabeth**—COURT HOUSE—Bd. Freeholders Union Co., Court House, bids about Dec. 15, 5 story, basement, brick, steel, rein.-con. addition, Rahway and Broad Sts. $500,000. Oakley & Son, 1259 Clinton Pl., archts. Noted Oct. 30.

**N. J., Morristown**—COURT HOUSE—Bd. Freeholders Morris Co., Court House, bids about Jan. 15, general contract 4 story, brick, steel addition, plain found., Washington and Court Sts. $250,000. Palmer & Plonsky, 55 William St., New York, archts. Noted Oct. 2.

**N. Y., New York** — OFFICE — Dec. 1, by J. Miller, pres. Manhattan Boro, Municipal Bldg., constructing foundations for new Municipal Building, Worth, Centre, Leonard and Lafayette Sts., for Dpts. Health, Hospitals and Sanitation. Noted Nov. 20.

**N. Y., New York**—PRISON—Dec. 4, by Dpt. Correction, Municipal Bldg., general construction, power plant, plumbing, electrical work, Rikers Island Penitentiary, East River. Former bids rejected. Noted Sept. 25.

### CONTRACTS AWARDED

**Conn., Stamford** — ALMS HOUSE — City, Municipal Bldg., Bd. Selectmen, 3 story, basement, 90 x 188 ft., brick, concrete, steel, to Thomas Perrone, Inc., 117 Branford St., Hartford, $89,673. Noted Oct. 23.

***La., Algiers**—ALMS HOUSE—City, c/o City Clerk, Touro-Shakespeare Home (alms house), 3 story, 197 x 204 ft., brick, stucco, to Caldwell Bros., 816 Howard Ave., and Bond Bros., 816 Howard Ave., $252,295. Noted Sept. 25.

**Que., Montreal**—FIRE STATION—Corporation of Montreal, 69 x 160 ft. fire station, St. James W., to Hevoux & Robert, 1414 Crescent St., $180,000.

## BUILDINGS—UNCLASSIFIED

### PROPOSED WORK

**N. Y., New York** — DORMITORY, etc. — L'Eglise St. Jean Baptiste, 184 East 76th St., lets contract after Jan. 1, general contract dormitory, apartments, 194 East 76th St. To exceed $150,000. Bids and estimates already taken. R. J. Reiley, 12 East 41st St., archt.

**O., South Euclid**—MEMORIAL—Protestant Memorial Assn., c/o W. J. Wefel, archt., 5716 Euclid Ave., Cleveland, sketches 1 and 2 story, 150 x 250 ft., brick, steel, concrete memorial building, incl. mausoleum, chapel, Monticello Blvd. and Anderson Rd. $710,000.

**Wash., Tacoma**—EXCHANGE—Pacific Telephone & Telegraph Co., I. F. Dix, vice.-pres. and genl. mgr., 919 Market St., telephone exchange. $500,000.

### BIDS ASKED

**Mass., Framingham**—EXCHANGE—Nov. 28, by New England Telephone & Telegraph Co., 245 State St., Boston, brick, steel, Union St. and Lexington Ave. $150,000. R. C. Sturgis, 120 Boylston St., Boston, archt. Noted Nov. 20.

**N. J., New Brunswick—GARAGE**—See "Contracts Awarded."

### CONTRACTS AWARDED

**N. J., Keyport** — EXCHANGE — New Jersey Bell Telephone Co., 540 Broad St., Newark, general contract 2 story, basement, brick, steel, to C. R. Davidson, Atlantic St. Est. $150,000. Noted Oct. 30.

**N. J., New Brunswick**—GARAGE—S. Kaplan, 295 Burnet St., 1 story, basement, 65 x 200 ft., brick, steel, plain found., Burnet St., separate contracts. $150,000. H. G. Bach, 63 Schureman St., archt.

**N. Y., New York** — RESTAURANT and KITCHENS — H. Seagel, 1279 East 24th St., Brooklyn, restaurant, kitchens, to T. J. Murphy, 2 West 45th St. Est. $150,000.

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# Buildings

## FACTORIES AND MILLS

### PROPOSED WORK

**Ill., Chicago**—ICE CREAM MANUFACTURING PLANT—Peoples Fuel & Supply Co., 4921 South Racine St. (subsidiary Borden Farms Products of Illinois), soon lets contract ice cream manufacturing plant. To exceed $300,000.

**Ill., Chicago** — MANUFACTURING — Prest-O-Lite Co. (Union Carbide & Carbon Co.) 30 East 42nd St., New York, manufacturing plant. To exceed $100,000. **Maturity in spring.**

**Mass., Marlboro** — PLANT — L. Auclaire & Sons, 83 Broad St., rebuilding orange crush plant, Elm St., recently destroyed by fire. $40,000. Architect not selected.

**Neb., Lincoln**—ASSEMBLY and DISTRIBUTION PLANT — International Harvester Co., W. D. Price, in charge, 606 South Michigan Ave., Chicago, Ill., soon lets contract assembly and distribution plant. $125,000.

**N. J., Bayonne**—FACTORY—National Electric Products Corp., 233 Bway., New York, factory. To exceed $40,000. **Maturity indefinite.**

**N. J., Elizabeth**—SHIRT FACTORY—Fordham Shirt Co., 604 Fulton St., plans by L. Quien, Jr., 229 Broad St., 2 story, basement, 30 x 100 ft., brick, steel addition, plain found. $40,000.

**N. J., Newfield**—FACTORY—R. Cleelands Sons, 112 Waverly St., Phila., Pa., rebuilding factory destroyed by fire. To exceed $100,000. **Maturity indefinite.**

**N. J., Paterson** — FACTORY — J. S. Royal, c/o Lee & Hewitt, archts., 152 Market St., 2 story, basement factory. Project in abeyance. **Maturity in February, 1931.** Noted Oct. 16.

**O., Waynesburg**—FACTORY—Whitacre-Greer Co., rebuilding 2 story, hollow block and brick factory, recently destroyed by fire. $40,000. Private plans.

**N. J., South River**—YACHT PLANT—Seawood Corp., A. Wood, in charge, 16 West 61st St., New York, Yacht building plant, William St. $40,000 or more. **Maturity in February.** Architect not selected. Noted Nov. 20.

**N. J., Trenton**—POTTERY PLANT—Lockwood, Greene Engineers, Inc., engrs. and archts., 100 East 42nd St., New York, soon let general contract 1 story, basement, brick, steel, North Clinton Ave., for Trenton Potteries Co., North Clinton Ave. $40,000.

**Pa., Ambridge**—MANUFACTURING—National Electric Products Corp., 233 Bway., New York, expansion in line of manufacturing additional products made of copper. To exceed $40,000. **Maturity indefinite.**

### BIDS ASKED

**Ala., Mineral Springs**—CHEMICAL PLANT—See "Contracts Awarded."

**Ga., Swainsboro**—BOTTLING PLANT—Dec. 1, by Pringle & Smith, archts., Norris Bldg., Atlanta, 2 story, basement, brick, rein.-con., for Alabama Coco-Cola Bottling Co., c/o J. Eros, Anniston. $85,000. Noted Oct. 16.

**N. J., Newark** — FACTORY — M. N. Shoemaker, archts., 10 Bleecker St., bids about Dec. 15, general contract altering and 2 story, basement, brick, steel addition, 361-65 6th Ave., for Weldon Roberts Rubber Co., 18 Oliver St. Est. $40,000. Noted Oct. 23.

**Wash., Longview**—CREAMERY—Lower Columbia Dairy Assn., A. E. Engbretso, secy., Astoria, bids about Jan. 1, general contract creamery, 11th and California Way. $80,000.

### CONTRACTS AWARDED

**Ala., Mineral Springs**—CHEMICAL PLANT—E. I. Du Pont de Nemours & Co., Wilmington, Del., altering and constructing chemical plant additions, day labor and separate contracts. To exceed $100,000.

**Ia., Spencer**—GAS PLANT—Skelly Oil Co., El Dorado, concrete, brick, tile Butane-air gas plant and distribution system, incl. two 10,000 gal. tanks, storage in two 10 x 40 ft. tanks, two 7,000 cu.ft. per hr. compressor units, day labor under supervision W. G. Watkins, engr.; installation distribution system, to Verhelst-Van Driest Constr. Co., Ostburg, Wis.

**Mass., Cambridge**—FACTORY—Sweet-Silby, Inc., 148 Sidney St., rebuilding 1 story, 80 x 120 ft., brick, plain found., recently destroyed by fire, to Scully Co., 238 Main St. Est. $40,000.

**N. Y., New York**—FILM FACTORY—Attica Film Corp., 1501 Bway., general contract film factory, to Turner Constr. Co., Graybar Bldg. Est. $550,000. Noted Nov. 20.

**Pa., Pittsburgh** — DAIRY — Liberty Dairy Products Corp., 6th and Forbes Sts., brick, steel, Aurelia and Dennison Sts., to Nicola Building Co., 6388 Penn Ave. Est. $150,000.

**Ont., Gravenhurst**—BOAT FACTORY—Rainbow Boat Wks. Ltd., 1 story, 75 x 250 ft., brick, steel, to J. R. Carson, Orillia. Interested in prices complete equipment. Noted Nov. 13.

**Que., Montreal**—FACTORY—Sherwin Williams Ltd., 75 x 61 ft. addition, St. Charles St., to A. F. Byers & Co. Ltd., 1226 University St., $42,000.

**Que., Montreal**—GAS STATION—Imperial Oil Co., 36 x 146 ft. gas station, Demontigny St. E., to W. G. Hunt Co., 1405 Bishop St., $58,000.

## GARAGES

### PROPOSED WORK

**N. Y., New York**—Corporation, c/o Shampan & Shampan, archts., 188 Montague St., Brooklyn, garages, Antin Pl. $300,000. **Maturity indefinite.**

### BIDS ASKED

**N. Y., New York**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Ill., Waukegan**—Pub. Serv. Co. of Illinois, 72 West Adams St., general contract 1 story, 72 x 142 ft. garage and storeroom addition, to MacDowell Constr. Co., 140 South Dearborn St., Chicago. Est. $60,000.

**N. Y., New York**—Rosella Building Co., D. LaSala, pres., 151 Mosholu Parkway, 2 story, 110 x 120 ft. service garage, Webster Ave. and 176th St., separate contracts and day labor. $75,000. Siegel & Levy, 1775 Bway., archts.

**N. Y., New York**—Seven Hundred Ten 12th Avenue Corp., N. Wallenstein, pres., 33 West 42nd St., 3 story, 200 x 225 ft. service garage, to Wallenstein Constr. Corp., 33 West 42nd St. Est. $200,000. Noted Nov. 13.

## POWER PLANTS

### PROPOSED WORK

**Ga., Elberton**—City, A. Hawes, mayor, hydro-electric plant and dam. Constitutional amendment to allow city to issue bonds passed at Nov. 4 election. H. S. Jandon Eng. Co., Elberton, engrs. Noted Oct. 23.

### CONTRACTS AWARDED

**N. Y., Port Ivory** (mail Staten Island) — Procter & Gamble Co., 17 Battery Pl., New York, general contract 1 story, basement, sub-basement, rein.-con. boiler house addition, plain found., to P. M. Sterling, 230 Park Ave., New York. Est. $40,000.

## SHOPS AND FOUNDRIES

### BIDS ASKED

**N. Y., New York**—SHED, etc.—Dec. 5, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., inspection shed and service buildings at Concourse Yard, West Bedford Park Blvd., West 205th St., Jerome and Navy Aves.

**Ont., Hamilton**—CIVIC MACHINE SHOPS—Dec. 3, by S. H. Kent, city clk., 1 story, 52 x 105 ft., brick, Elgin St. $70,000. W. L. McFaul, city engr.

### CONTRACTS AWARDED

**O., Cincinnati** — FOUNDRY — Buckeye Fdry. Co., 2257 Buck St., 1 story, 120 x 280 ft., rein.-con., brick, steel, plain found., Bekman St., to D. Meinken & Son, 2143 Barnard St., $150,000.

## WAREHOUSES

### PROPOSED WORK

**N. Y., Albany** — Goodrich Silvertown, Inc., 1043 Bway., bids early in December, 2 story, basement warehouse. $160,000.

**N. Y., Buffalo**—H. E. Palmer & Associates, archts., 775 Main St., bids in January, 2 story, 90 x 350 ft., with 45 x 90 ft. wing, for owner, c/o architects. $125,000.

### BIDS ASKED

**Mass., Cambridge**—See "Contracts Awarded."

**N. J., Irvington** (br. Newark)—N. J. Convery, archt., 32 Walnut St., Newark, taking bids general contract 2 story, basement, 50 x 200 ft., brick, steel, plain found., Lyons Ave., for T. J. Lee, c/o architect.

### CONTRACTS AWARDED

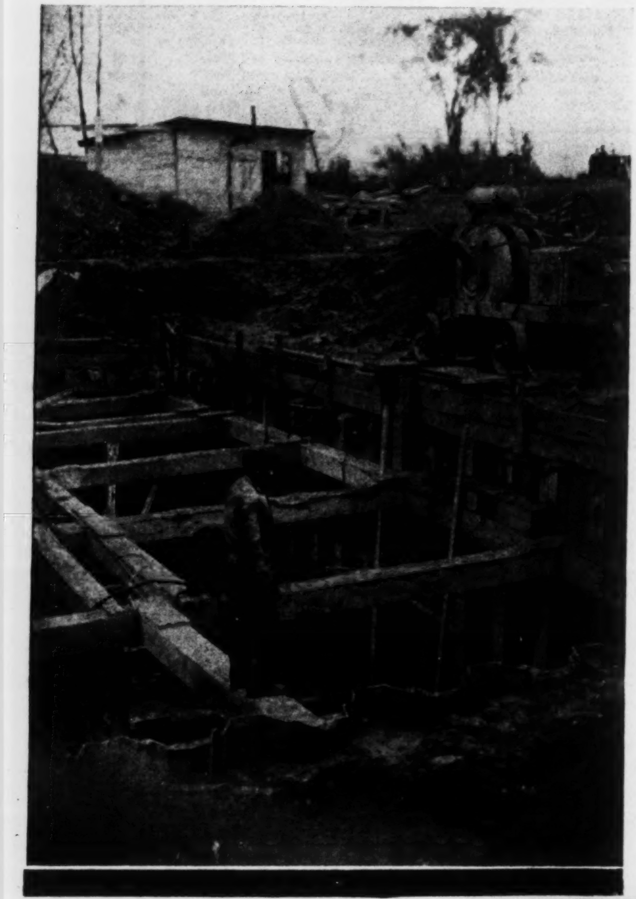
**Mass., Arlington**—H. L. Frost & Co., 20 Mill St., altering and constructing 3 story, basement, 55 x 100 ft., brick, concrete, steel, warehouse addition, plain found., to Holt-Fairchild Co., 7 Water St., Boston. Est. $50,000.

**Mass., Cambridge**—W. H. Crane, 1 Haywood St., 1 story, 60 x 200 ft. brick, concrete, steel storage, concrete found., separate contracts. $40,000. Private plans. Noted Nov. 13.

**Mo., St. Louis** — Central Transfer Co., 401 South 3rd St., 1 and 2 story, basement, rein.-con., brick, freight transfer building, 14th and Mullanphy Sts., to Humes-Deal Co., Arcade Bldg. Est. $50,000.

***See proposal advertising on page 94***

# IN THE FINGER LAKE REGION



ALL the precautions were taken. The deep arch, steel sheeting had plenty of penetration. Bottom was ready and the mixer placed. About that time MR. UNINVITED OUTSIDE PRESSURE crashed the gate by pushing the bottom up and kicking in some of the sheeting. When he quit there was nine feet of water in the hole. There was also an engineer in charge who knew what to do.

The next day a long distance MORETRENCH truck, carrying a relay of drivers, covered the three hundred miles to Finger Lakes with eight tons of the proper junk to pull Mr. U.O.P's. teeth.

*The*
MORETRENCH
WELLPOINT
SYSTEM MAKES
EVERY JOB A
DRY JOB—

Anytime—
Anywhere—
Any Size—
Under Any Condition.

**MOORE TRENCH MACHINE CO.**
**ROCKAWAY, NEW JERSEY**